

ER/WM&I DDT

Source/Driver: (Name & Number from ISP, IAG milestone, Mgmt. Action, Corres. Control, etc.)

Closure #: (Outgoing Correspondence Control #, if applicable)

Due Date

Vern Guthrie
Originator Name

J. R. Massie
QA Approval

Contractor Manager(s)

Kent Dorr
Kaiser-Hill Program Manager(s)

Brian Mathis
Kaiser-Hill Director

Document Subject:

TRANSMITTAL OF THE "SITE HAZARD ASSESSMENT REPORT FOR BUILDINGS 788 & 207A, REVISION 0, RF/RMRS-98-299.UN" - JEL-017-98

KH-00003NS1A

February 12, 1999

Discussion and/or Comments:

Attached please find five (5) copies of the ***"Site Hazard Assessment Report for Buildings 788 & 207A, Revision 0, RF/RMRS-98-299.UN"*** for transmittal to the Department of Energy (DOE) and the Colorado Department of Public Health and Environment (CDPHE). Included are two (2) copies for the DOE, one (1) copy for the CDPHE, and the remaining two (2) for Kaiser-Hill.

If you have any questions concerning this transmittal, please contact Greg DiGregorio at extension 5688.

cc:
R. Campbell
A. C. Crawford, B116
R. Feihweg
M. Rodriguez
Administrative Record
Readiness Assessment (2)
RMRS Records



ADMIN RECORD

Site Hazard Assessment Report
for
Buildings 788 & 207A Clarifier

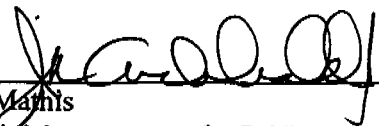
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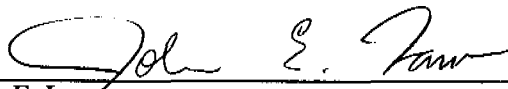
RF/RMRS-98-299.UN
Revision 0

February 1999


APPROVAL SIGNATURES

This Report is approved with respect to the data and conclusions relative to hazards, regulatory requirements, and overall (radioactive and chemical) characterization objectives of the Project.

 for 2/11/99
Brian Mathis
K-H Division Manager for D&D Projects Date

 2/10/99
John E. Law
RMRS Vice President South Side & ER Projects Date

 2/10/99
Vern Guthrie
RMRS Project Manager Date

 2/10/99
Jack Massie
RMRS Quality Assurance Date

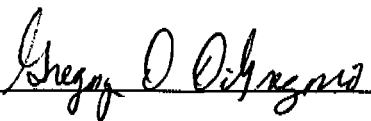
 2/9/99
Greg DiGregorio
RMRS Quality Assurance/Primary Author Date

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ACRONYMS

%R	Percent Recovery
AHA	Activity Hazard Analysis
AHERA	Asbestos Hazard Emergency Response Act
AIHA	American Industrial Hygiene Association
AS	Absorption Spectroscopy
Be	Beryllium
CA	(radiological) Contaminated Area
CCR	Colorado Code of Regulations
CDPHE	Colorado Department of Public Health and Environment
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DOT	Department of Transportation
dpm	Disintegrations per minute
DFTPP	decafluorotriphenylphosphine
DQO	Data Quality Objective
EPA	U. S. Department of Environmental Protection Agency
ER	Environmental Restoration
H&S	Health & Safety
ID	Identification
K-H	Kaiser-Hill
LBGR	Lower Bound of Gray Region
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LLM	Low Level Mixed Waste
LLW	Low Level Waste
MARSSIM	Multi-Agency Radiation Site Survey and Site Investigation Manual
MDA	Minimum Detectable Activity
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NVLAP	National Voluntary Laboratory Accreditation Program
PARCC	Precision, Accuracy, Representativeness, Comparability, Completeness
PCB	Polychlorinated biphenyl
PLM	Polarized Light Microscopy
PRE	Property Release Evaluation
QA/QC	Quality Assurance/Quality Control
RBA	Radiological Buffer Area
RCT	Radiological Control Technician
RFETS	Rocky Flats Environmental Technology Site
RPD	Relative Percent Difference
RSP	(RFETS) Radiological Safety Practice
SCO	Surface Contaminated Object (from RSP 09.05)
SDG	Sample Delivery Group
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leachate Procedure
TSI	Thermal Systems Insulation
TSDF	Treatment, Storage, or Disposal Facility
WAC	Waste Acceptance Criteria

EXECUTIVE SUMMARY

Chemical and radiological hazards have been characterized for Decontamination and Decommissioning (D&D) of the 207A Clarifier and Building 788. A Site Hazard Assessment was necessary to characterize chemical and radioactive hazards in the facilities, prior to demolition, for both waste management and Health and Safety purposes. The data confirmed earlier process knowledge: Low-Level Waste (LLW: ~70yd³) will be the primary waste form generated from the D&D process. Radioactive hazards are present as removable alpha in 3 localized areas whereas fixed alpha contamination is prevalent in all Characterization Survey Units except the interior and exterior walls of Building 788. Sampling and analysis revealed minor amounts of asbestos, but no additional hazardous constituents. The asbestos should not impact waste estimates given in the project's Waste Management Plan (asbestos 2yd³ and LLM ~21yd³). Hazards represented by the asbestos are minor, as the asbestos is in good condition (non-friable). All prospective materials resulting from the D&D process were characterized to comply with DOT requirements (for transportation purposes) and Waste Acceptance Criteria (for recycle purposes and disposal).

1.0 INTRODUCTION

This report results from implementation of the Site Hazard Assessment Plan for Buildings 788 & 207A Clarifier, RF/RMRS-98-249, Rev. 0. As stated in that Plan, the RFETS is currently undergoing environmental cleanup and closure. Building 788, the 207A Clarifier, and its associated facilities adjacent to the solar ponds have no practical purpose in the RFETS mission after Fiscal Year 1998. Therefore, the facilities are to be decommissioned to further reduce site risks, hazards, and operating costs. A Site Hazard Assessment was necessary to characterize chemical and radioactive hazards in the facilities, prior to decommissioning and demolition, for both waste management and H&S purposes. The physical layout for the project is shown in Figure 1-1.

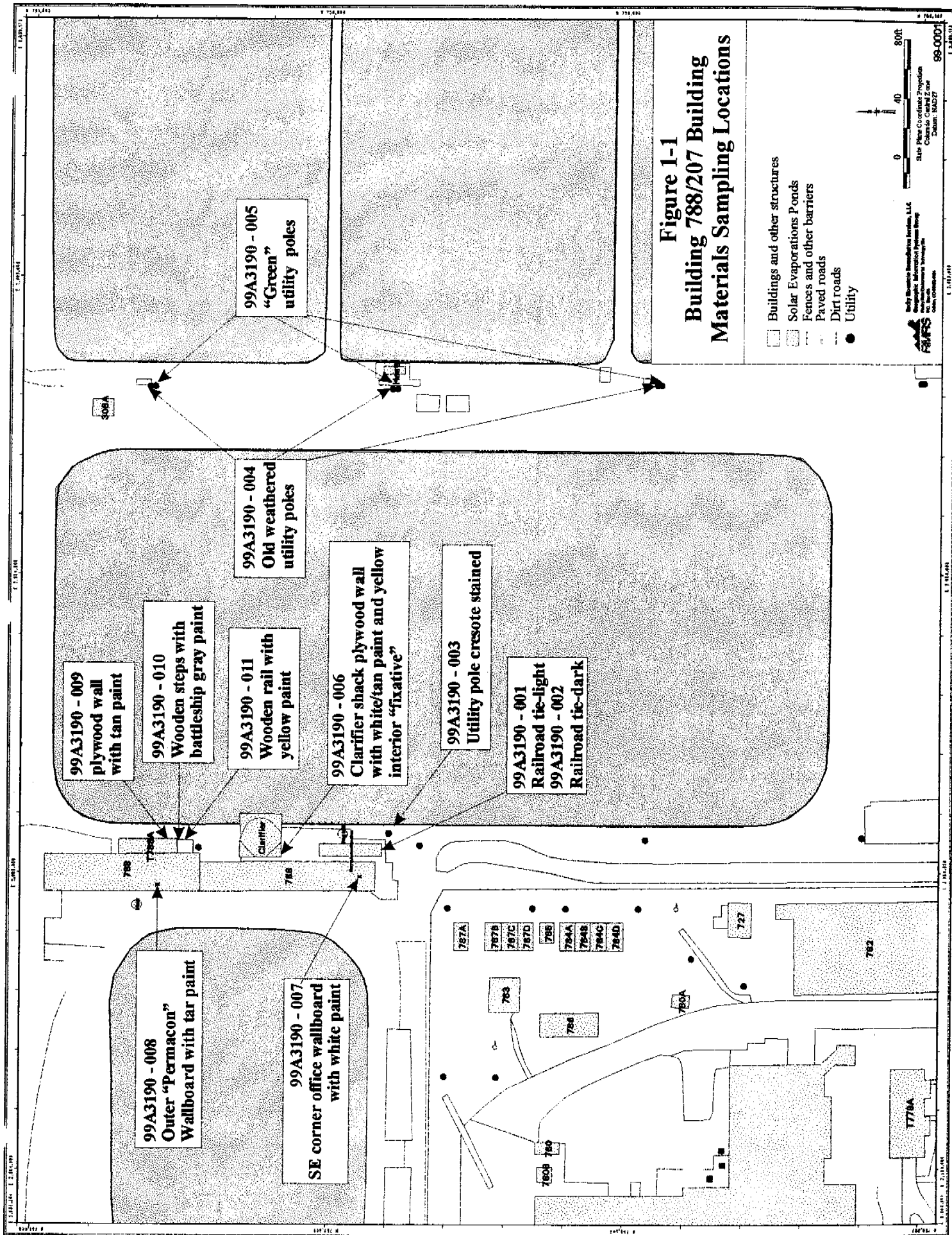
The content and general outline of this report is consistent with K-H guidance on composition of D&D documentation (FDPM, K-H, 1998).

1.1 PURPOSE

The purpose of this report is to communicate and document the results of the characterization effort established in the associated Site Hazard Assessment Plan (RMRS, 1998a). The purpose includes both summarizing the data into concise, usable formats and interpreting the data for use in management decisions, primarily:

- definition of individual hazards and overall risk associated with demolishing the structures and managing consequent waste, and
- categorization of waste types based on representative sampling.

Characterization of the facility and its materials is necessary as a prelude to job hazard analyses associated with D&D work in the field and to ensure compliance with state and federal waste regulations.



1.2 SCOPE

Consistent with the scope of the associated sampling plan, this report covers chemical and radiological characterization of the buildings and surrounding site structures as defined in the project-specific DQOs (§2.1). Environmental media beneath and surrounding the defined facilities, including (non-surficial portions of) concrete pads, are not within this scope. Because free release of the structures was not an objective, but rather recycling of materials as LLW, MARSSIM implementation was not required for this project. MARSSIM methodology will be required for the concrete pads and surrounding environmental media should free-release of the post-demolition area ever be a goal.

1.3 BUILDING/CLUSTER OPERATIONAL HISTORY

In general, the subject facilities of this report were used for processing radioactive sludges derived from the peripheral solar ponds. The 207A Clarifier, in particular, was used in the production of "pondcrete", a LLM waste material designed to stabilize radionuclides in sludge for storage and disposal. Building 788, adjacent to the clarifier, was used for storing a variety of wastes (LLW, LLM, and hazardous), as well as supporting 207A Clarifier operations.

The solar ponds were constructed in the 1950s and received wastes from various processes across the site. Pondcrete processing started in the mid 1980's and terminated in 1989 due to funding shortfalls. Building 788 and the 207A Clarifier are both RCRA Units (Unit 21 and Unit 48, respectively), but are currently undergoing formal RCRA Closure (DOE/RMRS, 1998).

Additional details on operational history have been summarized in the associated Site Hazard Assessment Plan (RMRS 1998a, which includes results from over 60 radiological surveys) and the Closure Description Document (DOE/RMRS, 1998). Given the history of the facilities, which included radioactive sludges (ranging up to 13 nCi/g ²⁴¹Am and 3.9 nCi/g ^{239,240}Pu) and listed hazardous wastes (a variety of D- and F- codes), the facilities were designated as Type 2 per the Decontamination and Decommissioning Characterization Protocol (Kaiser-Hill, 1998b).

2.0 SUMMARY OF CHARACTERIZATION/SURVEY RESULTS

2.1 DATA QUALITY OBJECTIVES

The project decisions based on hazard assessment data, as defined in the original Data Quality Objectives, are listed below. Further detail of the DQOs can be found in the Site Hazard Assessment Plan (RMRS, 1998a):

Radionuclides

What types and quantities of materials are contaminated and to what magnitude, with respect to materials assumed to be LLW?

Based on the HSA and the general history of the facilities, the estimated quantities of waste are given in the Project Execution Plan (PEP; RMRS 1998d, in progress).

Hazardous Constituents

Have all hazardous constituents been addressed for the waste streams?

- *wooden utility poles*
- *wooden ramp*
- *power substations — metal frames and attached hardware*
- *metal process lines/pipes/electrical conduit*

NOTE: because chemical samples will be analyzed relative to pass/fail of TCLP criteria, statistical adequacy of sample set is part of the decision, but rather the nominal outcome of "pass/fail" based on one representative, composite sample.

Asbestos

Is asbestos contamination present within the facility?

How many samples are required?

DQOs for the project are complete and consistent with the requirements set forth in the associated planning document (RMRS, 1998a). Contaminant types and quantities are now established with adequate confidence to disposition waste streams and determine acceptable levels. Measurement of contaminant types and quantities included hazardous constituents (as defined by RCRA), asbestos, and radionuclides. Accomplishment of DQOs provides adequate confidence to ensure compliance with DOT and WAC requirements (i.e., manage, ship, and submit LLW for recycling). Surveys for radiological characterization were performed as prescribed in PRO-267-RSP-09.05, which directly support the DOT and WAC requirements. Radiological surveys were designed for LLW determination and management, and based on the cost-benefit analysis that showed recycling to be more cost effective than attempting free-release of wasted materials.

Determinations as to waste types and site hazards are presented for the sampled media and radiological surveys in Tables 2-1, 2-2, and Section 3.0 (sp. Table 3-1). Quantities of waste types are presented in the Waste Management Plan (RMRS, 1998b).

2.2 SAMPLING & SURVEYING METHODS & EQUIPMENT

Radiological survey equipment and methods were followed as prescribed in the Site Hazard Assessment Plan (RMRS, 1998a.)

Chemical, radiochemical, and asbestos sampling were also implemented as described in the characterization plan (ibid.).

2.3 RADIOLOGICAL SURVEY RESULTS

Nine SCO Characterization Survey Units were completed at the end of December, 1998. Results of the completed SCO surveys are summarized in Table 2-1 and presented in their entirety in Appendix A. Although several areas yielded results exceeding free-release thresholds (DOE Order 5400.5) for Removable alpha and Total alpha, no areas exceed the SCO I thresholds, thus all Characterization Survey Units were classified as SCO I (49 CFR §173, Subpart I). Classification of materials as SCO I enables assignment of packaging and shipment controls necessary for compliance with DOT and successful transfer to the TSDF for recycling based on the TSDF WAC.

		Removable Contamination										Total Contamination												
	SCO I Limits (action level for Max. values)	alpha (dpm/100 sq. cm)					beta/gamma (dpm/100 sq. cm)					alpha (dpm/100 sq. cm)					beta/gamma (dpm/100 sq. cm)					Final Categorization		
	1/2 SCO I Limits (action levels for median and SD values)	1100	1100	Standard Deviation	Maximum	2,200	11,000	11,000	Standard Deviation	Maximum	22,000	5.E+05	5.E+05	Standard Deviation	Maximum	1.E+06	1.10E+08	1.10E+08	2.20E+08					
LOCATION	Characterization Survey Unit	Median					Median	Median				Median	Median			Maximum	Standard Deviation	Standard Deviation	Maximum					
Interior of Clarifier Tank	SCO-207-01-CI	117.0		142.5	636		200	200	22.69	220	22,000	212500 ^A	212500 ^A	NA	212500 ^A	212500 ^A	27,800 ^A	NA	27,800 ^A	SCO I				
Clarifier Tank Catwalk	SCO-207-02-CW	1.5		3.15	15		148	148	22.77	204		75	75	159.68	786	786	1177.5	215.37	1896	SCO I				
Bldg 788 Exterior Walls	SCO-788-06-WE	20		9.15	20		200	200	30.4	224		93	93	22.03	138	138	1114.5	225.99	2403	SCO I				
Bldg 788 Exterior Roof	SCO-788-07-RE	3		7.2	20		168	168	27.69	236		90	90	107.56	945	945	1332	248.78	2436	SCO I				
Bldg 788 Interior Walls	SCO-788-01-WI	3		4.46	18		160	160	25.6	264		66	66	37.71	234	234	1174.5	214.32	1644	SCO I				
Bldg 788 Ceiling	SCO-788-02-RI	9		6.59	27		176	176	32.82	272		58	58	77.55	384	384	1321.5	248.37	2280	SCO I				
Bldg 788 Contamination Control Room	SCO-788-03-CCR	3		19.12	114		156	156	26.02	204		57	57	110.46	672	672	1092	225.28	1740	SCO I				
Bldg 308A Pump House	SCO-308A-01-WE	0		2.25	9		208	208	17.49	236		558	558	367.34	1518	1518	1545	191.84	2118	SCO I				
Pug Mill and Cement Mixer ^A	SCO-EQU-01-PMCM	NA ^B		NA ^B	NA ^B		NA ^B	NA ^B	NA ^B	NA ^B	NA ^B	212500 ^A	212500 ^A	NA	212500 ^A	212500 ^A	27,800 ^A	NA	27,800 ^A	SCO I				
^A see Appendix A, Technical Basis Document 00119 for SCO determination																								
^B Not Available; see Appendix A																								

Table 2-1. Summary of Results from Radiological Characterization Surveys.

The facilities were segregated into nine SCO Characterization Survey Units consisting of 40 182 survey points per unit. The surveys measured Removable and Total alpha and beta/gamma contamination and were performed in accordance to RSP 09.05, Radiological Characterization for Surface Contaminated Objects, (RMRS 1998e). Results for the surveys are reported without background subtraction.

Based on the categorization of all 9 SCO Characterization Survey Units as SCO I, the associated waste produced from facility dismantling and demolition will be categorized as DOT SCO I and packaged accordingly.

The nine SCO Characterization Survey Units and their results are listed in Appendix A in the following order:

- 1) Bldg. 207 Interior of the Clarifier Tank
- 2) Bldg. 207 Clarifier Tank Catwalk
- 3) Bldg. 788 Exterior Walls
- 4) Bldg. 788 Exterior Roof
- 5) Bldg. 788 Interior Walls
- 6) Bldg. 788 Ceiling
- 7) Bldg. 788 Contamination Control Room
- 8) Bldg. 308A Pump House
- 9) Pug Mill and Cement Mixer

In addition to the SCO surveys, preliminary radiological characterization surveys were also conducted on the cement slabs in the Building 788 main floor area and the Contamination Control Room. Removable alpha or beta/gamma contamination levels associated with the Building 788 slab are below the limits identified in Table 2-2 of the Site Radiological Control Manual (RCM). Total (fixed + removable) alpha contamination was detected at various locations on the slab, primarily at the south pad of the Building. Figure 2-1 Building 788 Concrete Floor Radiological Samples and Figure 2-2 Contamination Control Room Radiological Samples represent the radiological survey points taken on the of the concrete floor.

TABLE 2-1

Radiological surveys performed in the Contamination Control Room, located in Building 788, identified areas of removable and total alpha contamination (Figure 2-1) in excess of the release criteria. All surveyed areas in the Contamination Control Room exceeded the release limits in Table 2-2 of the Radiological Control Manual. Radiological data for the concrete slab is presented in Appendix D.

Follow up surveys of Building 788 concrete slab, performed at a few selected locations, indicates that the contamination originally identified may be attributed to naturally occurring radioisotopes.

Removable contamination results also exceeded (maximum) free-release levels in the Clarifier Tank interior, and Building 788 ceiling. Total contamination results for alpha (maximum values) exceed free release thresholds in all units except the Building 788 exterior and interior walls. Estimation of the total activity for inaccessible items such as the Pug Mill, Cement Mixer, and Clarifier Tank (interior) are based on Technical Basis Document 00119, The Estimation of Total Surface Contamination Levels Utilizing Analytical Data Obtained From Analysis of Clarifier Sludge Material (in Appendix A).

To minimize the spread of contamination during size reduction/demolition, a fixative will be sprayed on the interior portion of the clarifier tank and B308A Pump House walls (interior and exterior). Surfaces containing localized areas of contamination exceeding free-release limits (DOE Order 5400.5) will be covered with a contrasting sealant (fixative) so that these areas may be easily identified and controlled during size reduction/demolition. The interior surfaces of the Pug Mill and cement mixer will need application of a sealant or the openings must be made inaccessible and posted accordingly.

2.4 ANALYTICAL & RADIOCHEMICAL (LAB) RESULTS

All samples were collected and analyzed as planned. No evidence of spills or secondary contamination existed in the areas sampled, thus no additional samples were necessary beyond those stipulated in the characterization plan. Actual sampling locations are displayed in Figure 1-1. Consistent with the DQOs, analytical results are presented for characterizing constituents of the bulk D&D materials for waste management and hazard assessment purposes. Results of the completed analyses are summarized in Table 2-2 and presented in their entirety in Appendix B.

Original data and supporting QC data used for this evaluation are stored in the K-H Analytical Services Division Records Repository under Report Identification Number (RIN) 99A3190. Analytical results were uploaded into the RFETS Soil & Water Database (SWD) for digital archival and data management purposes. Uploaded data will subsequently be checked for

consistency and traceability by the RMRS Sample Manager. All other supporting data is archived in the RMRS Project File under the auspices of the Project Manager, until submitted to the RMRS Records Center for permanent storage and retrieval.

The railroad ties of the ramp immediately southeast of Building 788 were sampled for Toxicity Characteristic Leaching Procedure (TCLP) semi-volatile organic compounds (SVOCs) because of unknown levels of creosote wood preservative (especially cresol) within the ties. Cresols were detected in both samples submitted for analysis, but were ~2 orders of magnitude below the hazardous waste regulatory thresholds. Therefore, the ties do not constitute hazardous waste.

Three sets of utility poles were sampled during this characterization effort. The first set was represented by a single biased sample (99A3190-003), collected at the highly stained (creosote) base of a utility pole located at the southeast corner of Building 788. Pentachlorophenol was detected in this sample, but at levels less than TCLP regulatory thresholds. As a result, it is inferred that this pole and similar ones are not hazardous waste because of their applied creosote preservative. Note that, because the preservative on the utility pole was identified as uniquely creosote, analysis for TCLP metals were not necessary, as metals were not inherent in the original creosote preservation process.

The second set of utility poles was represented by a composite sample collected from three weathered utility poles located between the 207A and 207B series ponds (Sample 99A3190-004). This sample was analyzed for TCLP-SVOCs and TCLP-metals as it was impossible to determine utility pole preservation without supporting characterization data. No SVOCs were detected. The quantitation limit was elevated above the TCLP thresholds for five SVOCs due to an analytical dilution by the laboratory for the first sample analyzed. The sample was subsequently reanalyzed, and no SVOCs were detected. Several metals were detected, including arsenic, barium, cadmium, chromium, copper, lead, and selenium, but

Media	Strategy	Analysis	Location	Sample Numbers	Results/Hazard Waste Determination
Railroad ties	Any dark stained portion of ties	TCLP SVOC (SW-846 1311 & 8270) DOT rad screen	ramp near SE corner of 788	99A3190-001 99A3190-002	Detectable cresol in both samples, but below TCLP regulatory thresholds. Not a hazardous waste
Utility pole - highly stained at base potentially creosote preserved	Visual outlier Collect biased sample at base of pole from highly stained (original preservative) area	TCLP SVOC (SW-846 1311 & 8270) DOT rad screen	pole C, just east of ramp at SE corner of 788	99A3190-013 supercedes 99A3190-003	pentachlorophenol detected below TCLP regulatory thresholds. Not a hazardous waste
Utility poles - old and weathered, unknown preservation	random composite from at least 3 poles	TCLP SVOC (SW-846 1311 & 8270) TCLP metals (SW-846 1311 & 6010) DOT rad screen	poles between 207A and 207B north middle and south ponds	99A3190-012 supercedes 99A3190-004	TCLP SVOCs below TCLP regulatory thresholds; data estimated due to interferences TCLP Cadmium at 1.6 mg/l (>TCLP) but non-hazardous per 6 CCR 1007-3, 261(b)(9)
Utility poles - green color indicates preservation using Wolmanizing process	random composite from at least 3 poles	TCLP metals (SW-846 1311 & 6010) DOT rad screen	poles between 207A and 207B north middle and south ponds	99A3190-005	metals > TCLP thresholds: Arsenic = 25 mg/L Chromium = 5.28 mg/L non-hazardous waste per 6 CCR 1007-3, 261(b)(9) All metals < TCLP thresholds Not a hazardous waste
yellow fixative and white paint on plywood	Collect sample near entry door outside of radiological contamination area	TCLP metals (SW-846 1311 & 6010) DOT rad screen	clarifier shack	99A3190-006	All metals < TCLP thresholds Not a hazardous waste
white paint/wallboard	random	TCLP metals (SW-846 1311 & 6010) DOT rad screen	office in SE corner of 788	99A3190-007	All metals < TCLP thresholds Not a hazardous waste
beige paint/wallboard	random	TCLP metals (SW-846 1311 & 6010) DOT rad screen	E outside wall of contamination control room in 788	99A3190-008	All metals < TCLP thresholds Not a hazardous waste
Tan paint/plywood	random	TCLP metals (SW-846 1311 & 6010) DOT rad screen	Porch structure, E side of T788A	99A3190-009	All metals < TCLP thresholds Not a hazardous waste
Grey paint/2x4 wood steps	random	TCLP metals (SW-846 1311 & 6010) DOT rad screen	Porch structure, E side of T788A	99A3190-010	All metals < TCLP thresholds Not a hazardous waste

Table 2-2. Summary of Results from Analytical & Radiochemical Sampling

only cadmium was detected above hazardous waste thresholds. Because of the presence of arsenic and other metals, it is inferred that the corresponding utility poles were preserved using an arsenic-based process. As such, these materials are excluded from regulation as hazardous waste based on 6 CCR 1007-3, 261(b)(9):

"Solid waste which consists of discarded arsenical-treated wood or wood products which fails the test for the Toxicity Characteristic for hazardous Waste Codes D004 through D017 and which is not a hazardous waste for any other reason if the waste is generated by persons who utilize the arsenical-treated wood and wood products for these materials' intended end use."

The third set of utility poles were represented by a composite sample collected from three relatively newer, olive-colored utility poles located between the 207A and 207B series ponds (Sample 99A3190-005). This sample was analyzed for TCLP metals as it was assumed the pole was preserved with a metallic-based preservative. High concentrations of several metals, including arsenic, were detected in leachate from the sample. Because the material was preserved with an arsenic-based process, the material is excluded from hazardous waste regulation in accordance with 6 CCR 1007-3, 261(b)(9).

Several of the painted wooden surfaces (Table 2-2) were sampled to determine if the paint coupled with the underlying building material exceeded TCLP hazardous waste thresholds. No metals results exceeded TCLP threshold levels. The paint samples were as follows:

yellow fixative and white paint (each side of plywood walls on 207A Clarifier shack)
white paint (wallboard in the office, SE corner of Bldg. 788)
beige paint (wallboard on outside of contamination control room within Bldg. 788)
tan plywood wind barrier/wall (porch structure on East Side of T788A)
grey 2x4" wooden steps (porch structure on East Side of T788A)
yellow 4x4" wooden rails (porch structure on East Side of T788A)

All of the samples submitted and analyzed for hazardous constituents were also screened for gross alpha and beta activity prior to shipment to the offsite lab (Appendix B). All sample results were well below DOT radioactive levels (i.e., <<2000 pCi/g). Figure 2-1

2.5 ASBESTOS RESULTS

A total of twenty asbestos samples were acquired and analyzed (19 real and one QC). Asbestos results by individual sample are given in Appendix C. Only one sample tested positive for ACM, which was taken from the roofing shingles situated on the porch roofs on the East Side of T788A. The suite of material types sampled included all of those typically suspected of asbestos -- thermal systems insulation (TSI -- electrical junction box shutes, wiring, etc.) and surfacing and miscellaneous materials. Samples were analyzed with PLM (Polarized Light Microscopy) in compliance with 40 CFR 763, Subpart F, Appendix A.

At the time of sampling and inspection, the roofing tar, felt, and shingles were non-friable and in good condition. Hazards presented by the asbestos are discussed in §3.2.4.

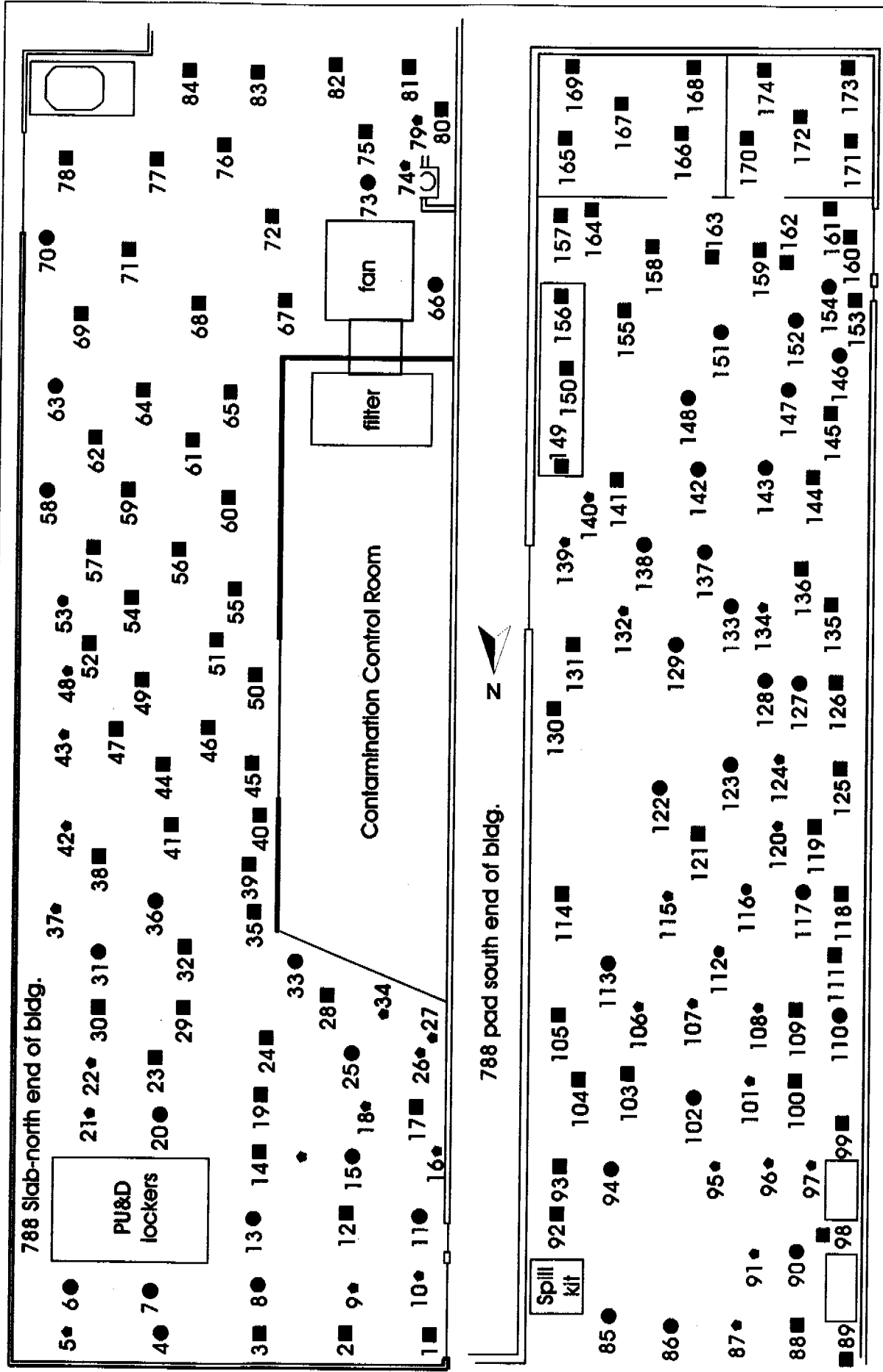


Figure 2-1 B788 Slab Floor: Total Fixed and Removal Alpha Contamination
 (Note: Drawing not to scale. All dimensions are approximate.)

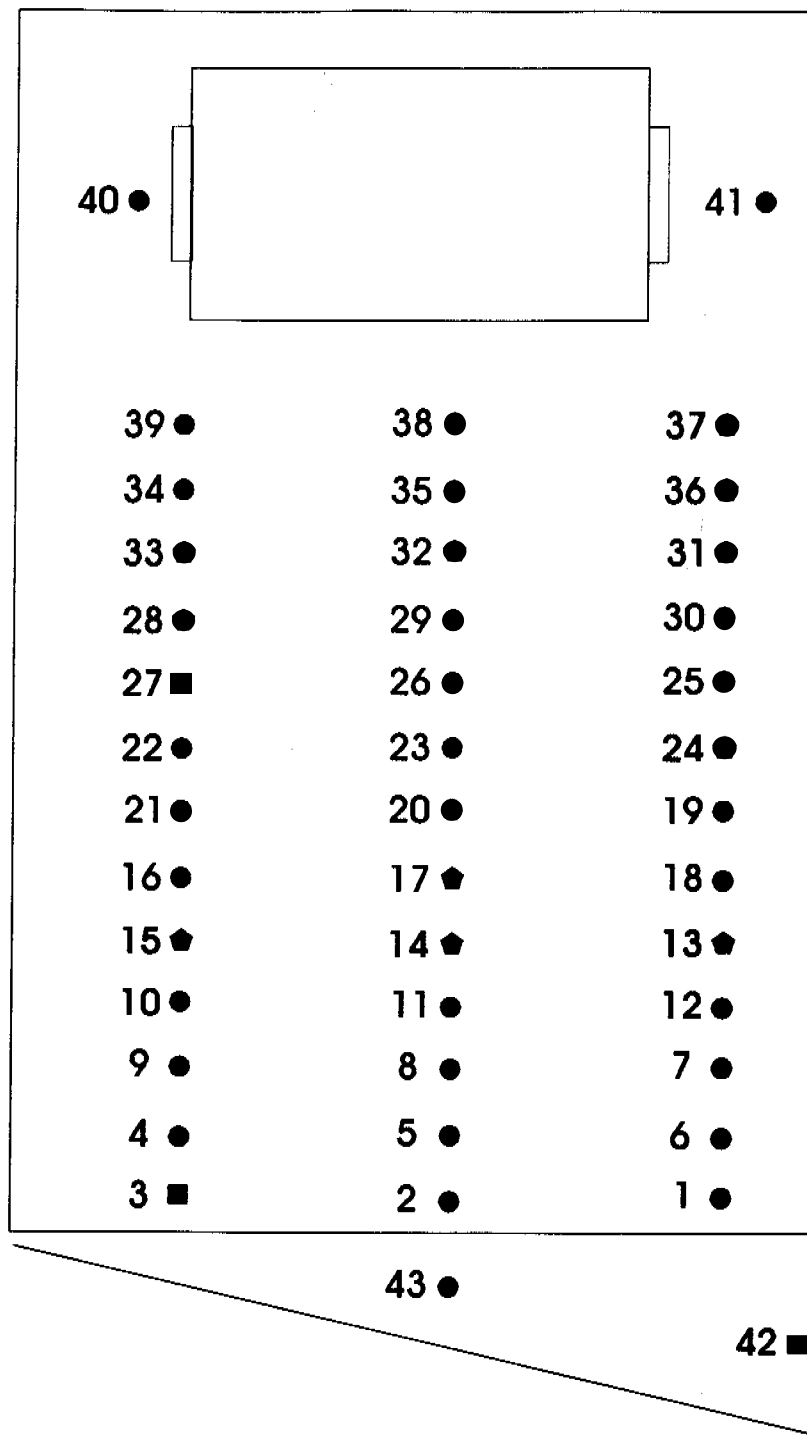


Figure 2-2 B788 Contamination Control Room - Slab Floor

(Note: Drawing not to scale. All dimensions are approximate.)



- > 100 dpm/100 cm² (total contamination) ■
- > 300 dpm/100 cm² (total contamination) ●
- Exceeds Table 2-2 of the RCM for Removable and Total Alpha Contamination ●

3.0 BUILDING /CLUSTER STATUS & HAZARDS

3.1 RCRA VS. CERCLA DESIGNATED AREAS

The 207A Clarifier Unit and Building 788 constitute RCRA Unit 48 and 21, respectively. These units are currently in the process of formal RCRA Closure (RMRS, 1998c). Following D&D of the facility as described in the Closure Description Document (§2.0), RCRA Closure will be completed. D&D coupled with the RCRA Closure process address disposition of all facility components, including the foundation surface, structural framing, walls (interior and exterior), floors, ceilings, roofing, doors, windows, surface finishes, vents, utilities (electrical, heating, water, gas, etc.), and process waste lines (industrial and sanitary systems). Any further remediation or environmental protection measures implemented on the remaining concrete pads or surrounding environmental media will be conducted under the RFETS ER program and CERCLA regulation.

3.2 HAZARDS

Hazards for the facilities of interest are summarized in Table 3-1.

3.2.1 Physical

Several physical hazards exist that are typical for industrial settings and construction projects, ranging from falls and confined space to handling sheet metal and fiberglass.

3.2.2 Radiological

Radiological hazards consist of fixed and removable alpha contamination at SCO I levels (Appendix A). Also, if these levels are in excess of Table 2-2 of the Radiological Control Manual, they pose a radiological internal hazard should they become airborne.

3.2.3 Chemical

The materials characterized in this section are typical building materials at the RFETS (Appendix B). Lead was detected in TCLP samples of the wallboard material located within Building 788, but at levels below TCLP thresholds. No lead was detected in the other painted surfaces on the east porch structure of T788A, thus none of the painted materials sampled are considered hazardous for waste management purposes.

Paint contained in the sheathing and I beams was not characterized for lead as it was assumed that the material would be unbolted during dismantlement. Such "nondestructive" dismantlement would not release any lead residing within the paint matrix. Industrial Hygiene indicated that, except for torch-cutting, activities where lead presence could create inhalation hazards, no additional H&S concerns exist with these materials. If however, the proposed plan for nondestructive dismantlement is changed to include grinding, sawing, or cutting, then these activities could create an inhalation hazard and additional protection for personnel would be required. Bulk metals with painted surfaces do not present hazardous waste based on the TSDF WAC specifications, where paint coatings at less than 2% of bulk weight are considered acceptable.

Utility poles and railroad ties are general industry materials that contain the hazardous chemicals addressed in §2.4 and Table 2-2. Appropriate IH practice should be implemented when handling these materials.

3.2.4 Asbestos

Approximately 100 ft² of shingles located in the porch roofs on the East Side of T788A contain asbestos (Appendix C). The shingles are in good condition and non-friable. The hazard category for these materials, as defined by EPA/AHERA, is "Miscellaneous materials in good condition". The only required response action is periodic inspection to determine if any significant deterioration has taken place. If roofing materials are removed, OSHA guidelines (29 CFR 1926.1101) will be implemented.

3.2.5 PCBs

Bulk metals with painted surfaces do not present PCB hazards or PCB waste based on the PCB megarule (Federal Register Vol. 63, No. 124, 6/29/98, re: PCB bulk product waste).

3.2.6 Pressurized Gas and Liquid Nitrogen

Pressurized gas (propane) is present in a supply tank and associated supply lines for heater units in Building 788. The propane supply and lines must be de-energized according to standard utility industry and IH practices prior to implementing D&D at the facility. There is no liquid nitrogen present at the facilities.

3.2.7 Electrical

Given the relatively young age and simple structure of the buildings and facilities, the potential for unknown electrical hazards is low. The power panels and junction-boxes noted in Table 3-1 are evident and well-defined. Appropriate IH practice will be implemented when working with these electrical systems.

3.2.8 Wastes

A summary of the estimated waste quantities (volume), by type, is given in Table 1 of the Waste Management Plan for the Building 788 Cluster Decommissioning Project (Rev. 0, December 1998).

Hazardous Waste

Characterization activities were designed to provide inputs to waste volume estimates contained in the Waste Management Plan for the Building 788 Cluster Decommissioning Project, RMRS/OPS-PRO.097. Sample results from potentially hazardous materials indicate that there are no significant additional hazardous materials beyond the original estimates.

Low Level Waste (LLW)

Although all sample results were well less than DOT radioactive levels (i.e., $<<2000$ pCi/g), the wooden matrix is treated conservatively as "volume-contaminated" because of its porosity, which is not amenable to conventional surface contamination measurements. Managing the wood in this manner (as LLW) is consistent with the "No-Rad-Added" Program in effect at RFETS. The alternative -- attempting free release of the materials -- would entail further sampling, analysis, and statistical comparisons of wood

Building/Facility	Description	Hazard	Matrix or Form of Hazard
Bldg 207A Clarifier	entire unit	physical	elevated platform (catwalk); ladders, falls; confined space
		radiological	fixed and removable alpha contamination
Pug Mill	entire unit	physical	elevated unit; sharp corners; confined space
		radiological	fixed alpha contamination (primarily on unit's interior)
Trailer T788A	roof shingles	asbestos	shingles on roof are in good condition (nonfriable); asbestos hazard is relatively low
Bldg 788	general area	physical	fiberglass; relatively thick sheets of fibrous insulation, primarily between interior & exterior walls and below roof
		physical	sheet metal; sharp edges
		electrical	energized systems; electrical panels, junction boxes
Utility Poles		physical	weight and geometry of poles during handling is foremost hazard
		chemical	characteristic (heavy) metals -- relatively fixed in the wooden matrix unless leached out in a landfill setting
Cement Mixer	exterior and west side of Bldg 788	physical	enclosed space; weight & geometry of unit during handling; sharp corners
		radiological	fixed alpha contamination
Bldg 308A (Pump House)	exterior	radiological	fixed alpha contamination
Contamination Control Room in Bldg 788	interior walls and ceiling	radiological	fixed and removable alpha contamination

Table 3-1. Hazard Summary.

results with background values. Based on a qualitative comparison of the cost of a background study vs. LLW management, the LLW option was chosen as most feasible.

Low Level Mixed Waste (LLMW)

The LLMW was based on process knowledge of the sludge removed from the solar ponds and the Technical Basis Document - 00119 provided in Appendix A and represents a worst case scenario. Based on this information, no LLMW was identified in this characterization.

TRU and TRU Mixed

Transuranic wastes are not present within the project boundaries and do not constitute a hazard for this project.

Sanitary

Insulation materials from the walls and ceiling of Building 788 constitute the only significant sanitary waste stream originating from the D&D process. Insulation material consists mostly of fiberglass and asbestos free material. The fiberglass material is believed to be wrapped in plastic throughout, thus all precautions relative to handling fiberglass should be taken during removal and packing.

3.3 FINAL BUILDING/CLUSTER CATEGORIZATION (TYPE) AND SUBSEQUENT STEPS IN THE DECOMMISSIONING PROCESS

The original categorization of the building as Type 2 remains applicable based on the results given in this report. RCRA closure is in progress for the two RCRA units and is anticipated to conclude following demolition of the buildings. Any subsequent remediation or environmental protection will fall within the site ER program and corresponding CERCLA and/or RFCA requirements.

4.0 DATA QUALITY ASSESSMENT

Data used in making management decisions -- in waste management and D&D projects -- must be of adequate quality to support those decisions. Adequate data quality for decision-making is required by applicable RMRS and K-H corporate policies (RMRS, 1998f, §6.4 and K-H, 1997, §7.1.4 and 7.2.2), as well as by the customer (DOE, RFFO; Order O 414.1, Quality Assurance, §4.b.(2)(b)). Regulators and the public also expect decisions and data that are technically and legally defensible. Verification and validation of the data ensure that data used in designing the project -- e.g., waste management and assessing real-time hazards -- are usable and defensible.

4.1 VERIFICATION OF RESULTS

Verification ensures that data produced and used by the project are documented and traceable per quality requirements. Verification consists of reviewing the data to confirm that:

- Chain-of-Custody was intact from initial sampling through transport and final analysis;
- preservation and hold-times were within tolerance; and,
- format and content of the data is clearly presented relative to goals of the project.

Results of the verification are included with validation results in §4.3.

4.2 VALIDATION

Validation consists of a technical review of the data, or portion of the data, so that any limitations of the data relative to project goals are delineated, and the associated data is qualified (caveated) accordingly. Data were validated relative to the PARCC parameters described in the next section. Validation is also currently performed on a site-wide basis at ~25% frequency by K-H Analytical Services Division. Satisfactory validation at this frequency indicates that the subcontracted labs are operating competently relative to industry-wide standards, and more specifically, that sample custody and analytical procedures are implemented under defined quality controls. Sitewide data validation coupled with annual lab audits provide the inference that all analytical and radiochemical results not specifically validated are represented by the percentage that is validated.

4.3 PARCC PARAMETERS

4.3.1 Precision

Radiological Surveys

Precision of the radiological instrumentation is satisfactory based on tolerance charting of daily source measurements. If any measurement exceeds the defined tolerance limits, corrective action is taken to repair or replace the instrumentation prior to measurement of real samples. Tolerance specifications may be found in the applicable Radiological Safety Practices.

Asbestos

Repeatability was adequate based on the field duplicate collected at a 5% frequency. Both the real sample and the duplicate were negative for ACM.

TCLP SVOCs

Precision for SVOCs was adequate based on acceptable RPD values derived from Matrix Spike/Matrix Spike Duplicate (MS/MSD) comparisons. Pyridine results should be qualified as estimates, however, as the RPD value was 24%. Ideally, RPD values in liquid matrices should be less than 20% to reflect satisfactory control in analytical reproducibility.

TCLP Metals

Precision for metals was adequate based on acceptable RPD values derived from both MS/MSD comparisons and LCS/LCSD comparisons (all within 20%).

4.3.2 Accuracy

Radiological Surveys

Accuracy of radiological surveys is satisfactory based on semi and annual calibrations of instrumentation and daily source checks that must perform within specified tolerances ($\pm 20\%$), as specified in the Radiological Safety Practices.

Asbestos

Accuracy for asbestos volumetric concentrations is based on the semi-quantitative technique of petrography via polarized light microscopy. Skilled professionals can typically quantify components to within several percent at high concentrations ranging to ~1% at low concentrations (i.e., presence or absence of the mineral of interest). Accuracy for the project is adequate, as no asbestos was detected

except for one sample, where concentrations (10%) were well above the decision level (action level) of 1%.

TCLP SVOCs

Accuracy of SVOCs are adequate, with two qualifications, based on the following analytical quality controls:

- initial calibration and continuing calibration of the measuring instrumentation
- performance checks (DFTPP),
- internal standard area/retention time checks,
- lab control samples (LCS),
- matrix spikes (MS), and
- blank results (method and TCLP).

These results are captured in the (unabridged) data package SDG Number (and RIN #) 99A3190, which is archived by K-H Analytical Services in Building 881. All SVOCs for GEL Lab Sample #9901103-01 are qualified as estimates based on the potential of a low bias due to low recovery of the surrogate 2-fluorobiphenyl. Another compound is additionally qualified as potentially biased low for all samples -- m,p-cresol -- based on low percent recoveries from both LCS and MS samples (10% and 9%, respectively). However, due to the relatively high action level of cresol -- 200 mg/L -- and given the low practical quantitation limit of cresol (0.1mg/L), this bias would appear to have little propensity toward causing false negative results.

TCLP blank quantitation limits were elevated above those of the method blank (100 ug/L vs. 10 ug/L, respectively), but were still less than the lowest applicable regulatory threshold of 130 ug/L (hexachlorobenzene), and therefore, blank results are acceptable.

TCLP Metals

Accuracy of metals results is adequate based on the following analytical quality controls:

- initial calibration and continuing calibration of the measuring instrumentation,
- interference check samples,
- serial dilutions,
- lab control samples (LCS),
- matrix spikes (MS), and
- blank results (preparation and TCLP).

Several metal detections were noted in the lab blanks at relatively low concentrations (including chromium and lead); however, concentrations were one to two orders of magnitude below regulatory thresholds and did not significantly affect sample result or conclusions. Stated differently, there is no risk that blank contamination caused false positives (results or decisions) as no samples resulted in assignment of hazardous materials due to elevated metals concentrations.

reanalyzed to accomplish quantitation limits below regulatory thresholds (Sample 99A3190-012.001). Sample 99A3190-012.001 was not performed within the EPA recommended holding time; thus, the results (all non-detects) are qualified as estimates with a potential negative bias. Otherwise, samples and surveys are representative based on the following criteria:

- familiarity with facilities -- multiple walk-throughs and collaborations by and within the sampling team;
- implementation of industry-standard Chain-of-Custody protocols;
- compliance with sample preservation and hold times;
- industry-standard and EPA-approved analytical methods;
- site-approved radiological survey methods; and,
- compliance with the SHAP (RMRS 1998a) -- reviewed & approved by management consensus.

The nationally recognized lab measurement methods were as follows:

asbestos: PLM (EPA 40 CFR 763, Subpart F, Appendix A)
SVOCs: EPA 1311/8270
metals: EPA 1311/6010

Radiological surveys were performed to RSP 09.05.

4.3.4 Completeness

The data set for this project is complete, with respect to both samples planned vs. collected and hardcopy information required in the archived data packages. Table 4-1 matrix summarizes the planned number of samples or surveys and the actual quantity of samples or surveys acquired for successful completion of the characterization. Asbestos sampling had a noticeable decrease between the number of samples planned and the number collected. Exceptions are listed in detail and by each individual sampling location/medium in Appendix C. All exceptions consisted of reducing samples or sample locations after field locations were evaluated by the certified asbestos inspector and considered superfluous.

Table 4-1 Data Completeness

Hazard type	Planned # of Samples	Actual # of Samples	Comments
chemical	11	12	1 additional sample was acquired to attain required SVOC method sensitivity
SCO radiological Characterization Survey Units	9 Survey Units and 677 samples	9 Survey Units and 677 samples	
Concrete Floor Radiological Surveys - Building 788 Main and Contamination Control Room	174 and 43 samples respectively	174 and 43 samples respectively	Surveys collected from the main floor in Building 788 and the Contamination Control Room
asbestos	~37	20	difference indicates excess samples not needed

4.3.5 Comparability

All results presented are comparable with similar hazard analyses (methods and media) on a national- and DOE-complex wide basis. This comparability is based on nationally recognized methods (especially EPA-approved methods), systematic quality controls, and thorough documentation of the planning, sampling, and analysis process.

4.3.6 Sensitivity

All analytical and radiological methods achieved adequate sensitivities in that quantitation limits were below regulatory thresholds, typically with a quantitation limit at less than 20% of the threshold; one notable exception was hexachlorobenzene, which was greater than 1/2 of the regulatory threshold.

4.4 SUMMARY

In summary, the data presented in this report have been verified and are qualified as valid for substantiating the conclusions and decisions reached for the project. Several SVOC results were qualified as potentially biased low. The highest risk for a false negative values lies within the hexachlorobenzene result, where sensitivity was within 30ppb of the regulatory threshold at practical quantitation limit values. Overall, however, the propensity for false negative values within the project data set as a whole is low based on the following rationale:

- the missed hold time was associated with the highly weathered utility poles, and
- all non-detection values (i.e., the practical quantitation limits) were below regulatory thresholds.

REFERENCES

Kaiser-Hill, 1998a. Facility Disposition Program Manual, Rev. 0, MAN-076-FDPM.

Kaiser-Hill, 1998b. Decontamination and Decommissioning Characterization Protocol, MAN-077-DDCP, Rev. 0, 11/20/98.

Kaiser-Hill, 1997. Kaiser-Hill Team Quality Assurance Program, Rev. 5, 12/97.

RFETS, 1997. Unrestricted Release of Bulk or Volume Material, 3-PRO-140-RSP-09.03, Rev. 0.

RMRS, 1998a. Site Hazard Assessment Plan for Buildings 788 & 207A Clarifier, Rev. 0, RF/RMRS-98-249.

RMRS, 1998b. Waste Management Plan for the Building 788 Cluster Decommissioning Project (Rev. 0, December 1998).

RMRS, 1998c. Closure Description Document, RCRA Units 21 and 48, RF/RMRS-98-288, Rev. 0, in progress.

RMRS, 1998d. Radiological Characterization for Surface Contaminated Objects, PRO-267-RSP-09.05, (Rev. 1, November 20, 1998).

RMRS, 1998e. Evaluation of Data for Usability in Final Reports, RF/RMRS-98-200, (Rev. 0, August 14, 1998).

RMRS, 1998f. Quality Assurance Program Description (QAPD), RMRS-QAPD-001, Rev. 2, 4/98.

RMRS, In Progress. IWCP B788 Decommissioning (MA78EG00).

APPENDIX A

RADIOLOGICAL CHARACTERIZATION SURVEY RESULTS

The Characterization Survey Units (Unit IDs underlined):

- 1) SCO-207-01-CI (interior of Clarifier Tank Catwalk)
- 2) SCO-207-02-CW (Clarifier Tank Catwalk)
- 3) SCO-788-06-WE (exterior walls of Bldg 788)
- 4) SCO-788-07-RE (exterior roof of Bldg 788)
- 5) SCO-788-01-WI (Bldg 788 interior walls)
- 6) SCO-788-02-RI (Bldg 788 Ceiling)
- 7) SCO-788-03-CCR (Bldg 788 Contamination Control Room)
- 8) SCO-308A-01-WE (exterior walls of the "pumphouse" (Bldg 308A))
- 9) SCO-EQU-01-PMCM (Pug Mill and Cement Mixer)

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-207-01-CI

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu ☐ Enriched U ☐ Depleted U ☐ Natural U ☐ Other ☒ (see comment section)

Contents of Characterization Survey Unit:

Interior of Clarifier Tank

Location: Located between Building 788 and 207A Solar Pond

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample. Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

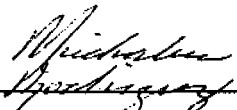
Survey Plan Comments and Special Instructions

Note: RWP Required For Entry

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicron A-100.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Prepared by: print Michalene Rodriguez
Radiological Engineer

sign

date 12-10-98Reviewed by: print John Miller

sign

date 12-14-98Approved by: print ESM BROOKS

sign

date 12/14/98

Each section of this form may be enlarged, or continuation pages added, as required.

SCO-CHAR-98-418

RADIOLOGICAL CHARACTERIZATION FOR SCOCharacterization Survey Unit ID SCO-207-01-CI

Page 2 of 2

Summary of Data

Removable Contamination Dpm/100 cm ²	Mean	Median	Standard Deviation	90th %
Alpha contamination	150.7	117.0	142.5	180.2
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	191.8	200.0	22.7	196.5

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	90th %
Alpha contamination	212,500 ¹	N/A	N/A	N/A
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	27,800 ¹	N/A	N/A	N/A

Attach copies of survey forms and sampling data.

Analysis of ResultsSCO I XX SCO II _____ Subdivide and resample _____**Comments:**

Removable survey points 1-12 were taken on 12/31/98. Not all areas of the clarifier tank floor were accessible due to the accumulation of water, ice, and snow over the past several weeks. Removable survey points 13-65 were taken from 8/19/98-9/16/98. These surveys were conducted during the removal of sludge material from the clarifier tank. Since the removal of all sludge material, the clarifier tank has been power-washed several times thus the removable activity revealed from survey points 13-65 may be conservative in nature.

Total (fixed and removable) measurements were not obtained due to the hazards associated with entry into the clarifier tank, i.e., confined space entry, ice and snow accumulation. An estimate of the total contamination present will be based on Technical Basis Document-00119¹ (See Attachment).

Prepared by Rad Eng print Michalene Rodriguez sign *M. Rodriguez* date 1/6/99
 Reviewed by Rad Eng print John Miller sign *J. Miller* date 1/6/99
 Approved by print ESTHER BROOKS sign *E. Brooks* date 1/6/99

SCO Statistical Analysis

SCO-207-01-CI

Survey Unit:	SCO-207-01-CI			
Description:	Clarifier Tank (Interior)			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
$t_{1/2}$ (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm ²)	Max. Total Activity (α) (dpm/100cm ²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm ²)	Max. Total Activity (β/γ) (dpm/100cm ²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm ²)	Total α Activity (dpm/100cm ²)	Removable β/γ Activity (dpm/100cm ²)	Total β/γ Activity (dpm/100cm ²)
1	51	N/A	128	N/A
2	69		172	
3	138		176	
4	9		172	
5	66		120	
6	126		144	
7	63		160	
8	3		148	
9	156		81	
10	174		184	
11	297		164	
12	204		220	
13	192		200	
14	51		200	
15	486		200	
16	132		200	
17	264		200	
18	39		200	
19	228		200	
20	420		200	
21	477		200	
22	592		200	
23	416		200	
24	114		200	
25	20		200	
26	20		200	
27	20		200	
28	20		200	

SCO Statistical Analysis

SCO-207-01-CI

29	20		200	
30	153		200	
31	267		200	
32	66		200	
33	324		200	
34	195		200	
35	129		200	
36	120		200	
37	160		200	
38	48		200	
39	108		200	
40	636		200	
41	225		200	
42	306		200	
43	54		200	
44	77		200	
45	104		200	
46	182		200	
47	23		200	
48	146		200	
49	68		200	
50	255		200	
51	20		200	
52	45		200	
53	171		200	
54	57		200	
55	159		200	
56	240		200	
57	117		200	
58	45		200	
59	20		200	
60	24		200	
61	42		200	
62	69		200	
63	75		200	
64	171		200	
65	30		200	
Size	65		65	
Max.	636		220	
Mean	150.74		191.83	
Median	117		200	
Std. Deviation	142.49		22.69	
UCL95	180.24	▼	196.53	▼
RSP 09.05 SCO Tests:				
α Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		N/A		
Median removable < 50% SCO I removable limit:		Yes		

SCO Statistical Analysis

SCO-207-01-CI

	Median total < 50% SCO I total limit:	N/A	
	Max. removable < SCO II removable limit:	Yes	
	Max. total < SCO II total limit:	N/A	
	Median removable < 50% SCO II removable limit:	Yes	
	Median total < 50% SCO I total limit:	N/A	
β/γ Contamination			
	Max. removable < SCO I removable limit:	Yes	
	Max. total < SCO I total limit:	N/A	
	Median removable < 50% SCO I removable limit:	Yes	
	Median total < 50% SCO I total limit:	N/A	
	Max. removable < SCO II removable limit:	Yes	
	Max. total < SCO II total limit:	N/A	
	Median removable < 50% SCO II removable limit:	Yes	
	Median total < 50% SCO I total limit:	N/A	

**The Estimation of Total Surface Contamination Levels Utilizing
Analytical Data Obtained From Analysis of Clarifier Sludge Material.**

January 5, 1999
Technical Basis Document-00119

Written By: Michalene Rodriguez  1/6/99
Radiological Engineer Signature Date

Reviewed By: John J. Miller  1/6/99
Radiological Engineer Signature Date

Approved By: H. Bates Estabrooks  1/6/99
Radiological Engineering Manager Signature Date

Purpose

The purpose of this document is to provide a technical basis for the methodology in applying analytical data obtained from the clarifier sludge material as an estimation of total surface contamination. This method will be applicable to various items with unsurveyable or inaccessible areas located in the vicinity of Building 788 and the Solar Evaporation Ponds (SEP).

Background

The Solar Evaporation Ponds, also known as the "high nitrate ponds," were used primarily for the disposal of low-level radioactive wastes contaminated with high concentrations of nitrate and for difficult to treat wastes. Solar pond clean-up activities began in the mid-1980's and was a response action to the presence of waste materials in the solar ponds and the presence of contamination in nearby soils, groundwater, and surface water. In 1985, Building 788, Trailer 788A, the 207A Clarifier Tank, and various ancillary equipment (Pug Mill, cement mixer) were constructed as part of the treatment process to convert pond sludge into pondcrete, which is a mixture of SEP sludge and Portland cement.

In 1989, the last of the process waste sludge was removed from Pond 207A and pumped into the open top clarifier tank. Clarifier operations were halted shortly thereafter leaving approximately 16,500 gallons of waste sludge and water in the 30,000 gallon capacity clarifier tank.

In 1992 and 1995 two laboratory analyses were conducted to determine and estimate the radionuclides and associated activities in the waste sludge. The first study in 1992, was from Brown and Root, Inc. The analysis revealed approximately 3400-6600 pCi/g gross alpha and 540-860 pCi/g gross beta activity in the sludge waste (Attachment I). The second study performed in 1995, from Halliburton NUS Corporation, estimated the sludge contained 13,000 pCi/g of Americium-241, 3,900 pCi/g of Plutonium-239/240 and 89 pCi/g of Plutonium-238 (Attachment II).

A letter dated January 7, 1998 to S.M. Nesta from C.A. Patnoe, K-H Air Quality Management, states the "Brown and Root analysis is the most accurate and representative analysis of the sludge and water contained in the tank." (Attachment III).

In 1998, the remaining sludge held in the Clarifier Tank was successfully removed. The mission today is the Decontamination and Decommissioning (D&D) of the Building 788 Cluster by June 30, 1999. This action will satisfy one of the requirements of Order on Consent 97-08-21-01 that has been agreed to by Kaiser-Hill. The general cleanup, removal and packaging of waste and equipment from the SEPs will supplement this action.

Technical Discussion

The waste generated from the D&D of the Building 788 Cluster will be disposed of as low-level waste, low-level mixed waste, or free released. The majority of the waste will be sent as low-level waste to a recycle metal melt facility and will be shipped, per Department of Transportation, as Surface Contaminated Objects (SCO). The low-level mixed waste will be sent to Envirocare or NTS and will be shipped as Low Specific Activity Waste. Few items from the D&D process will be free released. Items such as desks, chairs, lockers, and cabinets, located inside Building 788 and T788A will be free released upon survey results.

To demonstrate compliance with Radiological Safety Practice PRO-267-RSP-09.05, *Radiological Characterization For Surface Contaminated Objects*, DOT shipping regulations, and disposal site waste acceptance criteria, characterization surveys were conducted. The surveys were performed on the interior and exterior walls, roof top, and ceiling of Building 788, Contamination Control Room (located inside Building 788), interior surface of the clarifier tank (removable only), catwalk, and exterior walls of the 308A Pump House.

Certain items and materials such as the Pug Mill, Cement Mixer, Clarifier Tank (total) and wooden surfaces were not surveyed due to the items being inaccessible, posing a hazard, or composed of unsurveyable material. The intention to characterize these items is to apply the analytical data, taken from the sludge waste, from Brown and Root, Inc., as an estimate of total surface contamination for these items. The methodology imposed is shown below:

Alpha Parameters:

Description	Amount
Activity	6600 pCi/g
Density of Sludge (from Halliburton NUS Report)	1.45 g/cm ³
Thickness of Residual Sludge Remaining on Surfaces (assumed)	0.1 cm
Conversion Factor	1 Ci = 2.22E10 ¹² dpm

$$\text{Activity (dpm/100 cm}^2\text{)} = [6600 \text{ pCi/g}] [1.45 \text{ g/cm}^3] [0.1 \text{ cm}] =$$

$$[9.57\text{E}10^{-10} \text{ Ci/cm}^2] [2.22\text{E}10^{12} \text{ dpm}] [100 \text{ cm}^2] \sim 212,500 \text{ dpm/100 cm}^2$$

Beta Parameters:

Description	Amount
Activity	860 pCi/g
Density of Sludge (from Halliburton NUS Report)	1.45 g/cm ³
Thickness of Residual Sludge Remaining on Surfaces (assumed)	0.1 cm
Conversion Factor	1 Ci = 2.22E10 ¹² dpm

$$\text{Activity (dpm/100 cm}^2\text{)} = [860 \text{ pCi/g}] [1.45 \text{ g/cm}^3] [0.1 \text{ cm}] =$$

$$[1.25\text{E}10^{-10} \text{ Ci/cm}^2] [2.22\text{E}10^{12} \text{ dpm}] [100 \text{ cm}^2] \sim 27,800 \text{ dpm/100 cm}^2$$

Conclusions

The upper SCO I limit as specified in Table I of RSP-09.05 is 1,000,000 dpm/cm² for fixed Plutonium/Americium on inaccessible areas. Based on this information, items coming from the SEP area with inaccessible areas, i.e., Pug Mill, cement mixer, meet the definition of SCO I and will be assigned the above calculated activities.


References

PRO-267-RSP-09.05, Rev. 1, *Radiological Characterization for Surface Contaminated Objects*, November, 98.

Historical Release Report For The Rocky Flats Plant, Volume I, June, 1992.

Safety Analysis For Clarifier To RCRA Stable Project, Nuclear Safety Technical Report, Revision 0, NSTR-017-97, Rocky Mountain Remediation Services, LLC, December, 1997.

Integrated Safety Management Plan For The Clarifier To RCRA Closure Project, Revision 0, RF/RMRS-98-213UN, Rocky Mountain Remediation Services, LLC, May, 1998.

Brown & Root, Inc. 	CONTRACT NO. JR-1198
STANDARD PROCESS DATA SHEETS	IDENTIFICATION NO. 000-020-00-001
APPROVAL DATE 06/04/92	PAGE 46 OF 97

ANALYSIS	UNITS	RANGE	MEAN ^(a) CONCENTRATION
Cyanide-Amenable	mg/kg	NA	NA
Cyanide-Total	mg/kg	21-190	87
Gross Alpha	pCi/g	3400-6600	5250
Gross Beta	pCi/g	540-860	695
Moisture-Gravimetric	%	33.1-72.5	60.6 ^(a)
Moisture-Karl Fisher	%	NA	NA
pH	units	9.7-9.8	9.75
Specific Gravity	-	NA	NA
Swell Test	%	10	10
TOC (Total Organic Carbon)	mg/kg	3500-6400	5175
Chloride ^(a)	mg/l	160-180	168
Nitrate ^(a)	mg/l	410-450	430
% Recovery of Solids ^(a)	%	18.0-22.2	21
Phosphorus, Total (as P) ^(a)	mg/l	33-52	46
Sulfate ^(a)	mg/l	210-280	243
TDS (Total Dissolved Solids) ^(a)	mg/l	4600-5400	4950
Total Solids	%	27.5-66.9	39.4

Inorganics

Arsenic	mg/kg	13.5-21.9	12
Barium	mg/kg	94.8-217	183
Boron	mg/kg	420-1380	930
Cadmium	mg/kg	2010-4660	3660
Chromium	mg/kg	1180-3190	2480
Lead	mg/kg	83-191	161
Magnesium	mg/kg	10,400-24,200	20,500
Mercury	mg/kg	5-14	9
Nickel	mg/kg	339-902	700
Potassium	mg/kg	28,700-67,900	56,500
Selenium	mg/kg	ND	ND
Silver	mg/kg	64.6-166	134.9
Sodium	mg/kg	39,200-96,300	78,900

SLUDGE



Halliburton NUS
CORPORATION

NUS LABORATORY
5350 Campbells Run Road
Pittsburgh, Pennsylvania 15205

TEL: (412) 747-2500

FAX: (412) 747-2559

May 05, 1995

Report No.: 00025501

Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: ROCKY FLATS - C/O MUS CORPORATION

ADDRESS: 661 ANDERSEN DRIVE

PITTSBURGH, PA 15220-

ATTENTION: MR. RICH NINESTEEL

MUS CLIENT NO: 1431 0007

WORK ORDER NO: 3A23

VENDOR NO:

SAMPLE ID: CLARIFIER AS REC'D

MUS SAMPLE NO: P0297299

P.O. NO.:

DATE SAMPLED: UnAvail

DATE RECEIVED: 03-JAN-95

APPROVED BY: Lynch, Pat

LN	TEST CODE	DETERMINATION	RESULT	UNIT
1	R110AS	Isotopic Americium and Curium Americium-241 (Am-241)	13 +/- 2	nCi/g
2	R200S	Gamma Spectroscopy Cesium-134	< 4	pCi/g
		Cesium-137	< 6	pCi/g
3	R110PS	Isotopic Plutonium Plutonium-238 (Pu-238)	89 +/- 37	pCi/g
		Plutonium-239/240 (Pu-239/240)	3900 +/- 400	pCi/g
4	R05S	Radium-226 (Ra-226)	6.2 +/- 0.7	pCi/g
5	R110US	Isotopic Uranium Uranium-233/234 (U-233/234)	28 +/- 3	pCi/g
		Uranium-235 (U-235)	1.1 +/- 0.2	pCi/g
		Uranium-238 (U-238)	32 +/- 4	pCi/g
6	R11S	Strontium-89 and -90 Strontium-89 (Sr-89)	0.53 +/- 0.06	pCi/g
		Strontium-90 (Sr-90)	0.88 +/- 0.27	pCi/g
7	ABES	Beryllium, Total (Be)	320	mg/kg
8	ACDS	Cadmium, Total (Cd)	2100	mg/kg
9	S088	Bulk Density on Waste	1.45	g/cc
10	1630	Percent Moisture	61.9	%
11	1490S	Non-aqueous sample pH in Water	9.8	
19	DPACK	CLP Data Package Deliverable	DONE	

COMMENTS:

- 2 Density of original sample 1/10 of the density of standard.
Density adjusted to 98% of standard. (All Nuclides affected.)



KAISER • HILL
COMPANY

INTEROFFICE MEMORANDUM

DATE: January 7, 1998

TO: S. M. Nesta, National Environmental Policy Act, Bldg. T130C, X6386

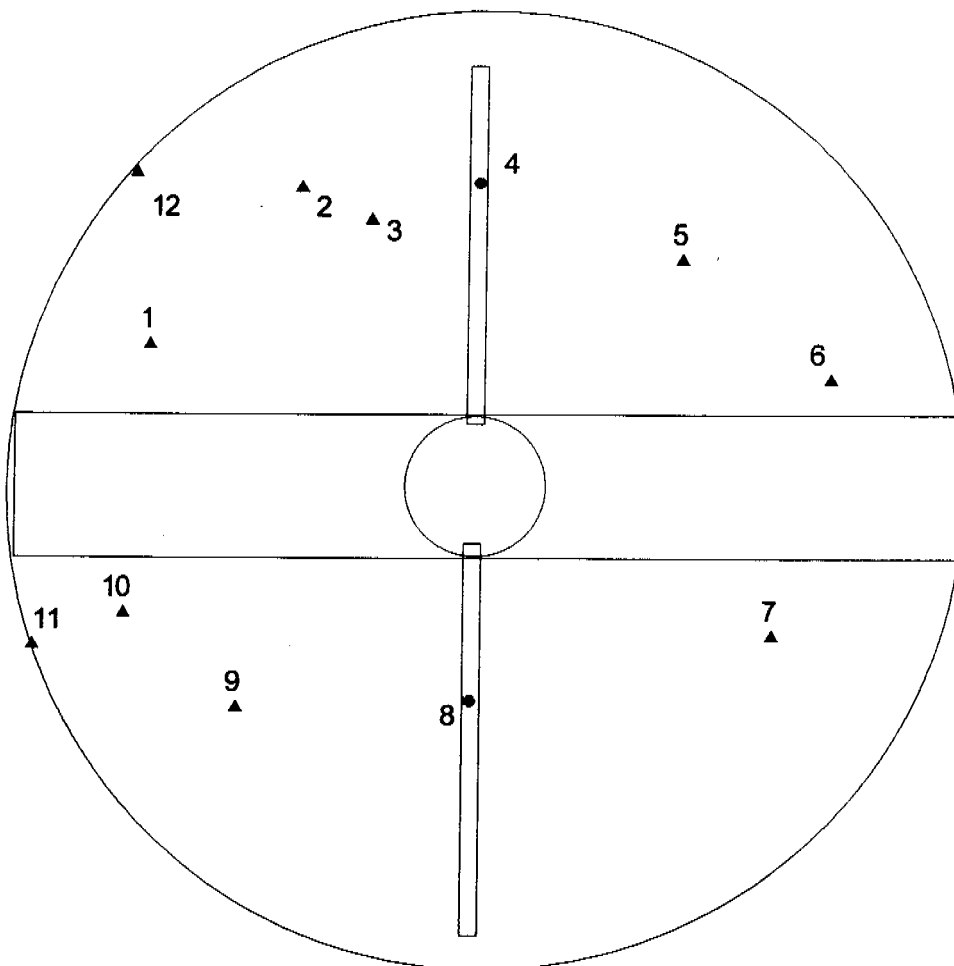
FROM: *C. A. Patnoe*
C. A. Patnoe, K-H Air Quality Management, Bldg. T130C, X2440

SUBJECT: AIR QUALITY REVIEW OF THE PROJECT TO EMPTY THE SOLAR PONDS CLARIFIER TANK - CAP-003-98

Ref: Letter #SMN-236-97 to distribution entitled "Review of the Project to Empty the Solar Ponds Clarifier Tank", dated December 17, 1997, the attached NEPA checklist, the preliminary project plan dated October 30, 1997, and Brown and Root laboratory data sheets, identification number 000-020-00-01 dated 06/04/92

Per your request, Air Quality Management/Radian International has evaluated the project to remove solar pond sludge from the Building 788 clarifier tank for air quality regulatory issues. The project has a potential to emit regulated air pollutants and was assessed to determine reporting, air permitting, regulatory approval, testing, recordkeeping, and monitoring requirements. This assessment is based on the following worst-case, bounding assumptions derived from information provided by project personnel:

- The tank is an open-top tank, has a capacity of 30,000 gallons, and currently contains approximately 16,500 gallons of sludge and water.
- The Brown and Root, Inc. laboratory analysis from 1992 is the most accurate and representative analysis of the sludge and water contained in the tank.
- For the purposes of this air assessment, radionuclide contamination is assumed to be 6,600 picocuries per gram (pCi/g) gross alpha (assumed to be americium 241), and 860 pCi/g gross beta (assumed to be plutonium 241) for the entire contents of the tank.
- The highest concentration volatile organic contaminant (VOC) level is tetrachloroethylene (BIN A hazardous air pollutant) at 1,000 micrograms per kilogram. The highest concentration regulated inorganic contaminants are cadmium at 4,660 milligrams per kilogram (mg/kg), and chromium at 3,190 mg/kg (BIN A hazardous air pollutants).
- The average specific gravity for the tank contents is 1.28 (36% total dissolved solids).
- The project will utilize sparging and high pressure water sprayers to help mobilize the sludge during draining operations.
- Conservative estimates for cadmium and chromium emissions were calculated utilizing particulate emission factors for cooling towers.
- All fuel-fired compressors and generators utilized during the project will be existing on-Site units.



NOTE: Points 11 & 12 were sampled on the inside-top lip of tank.

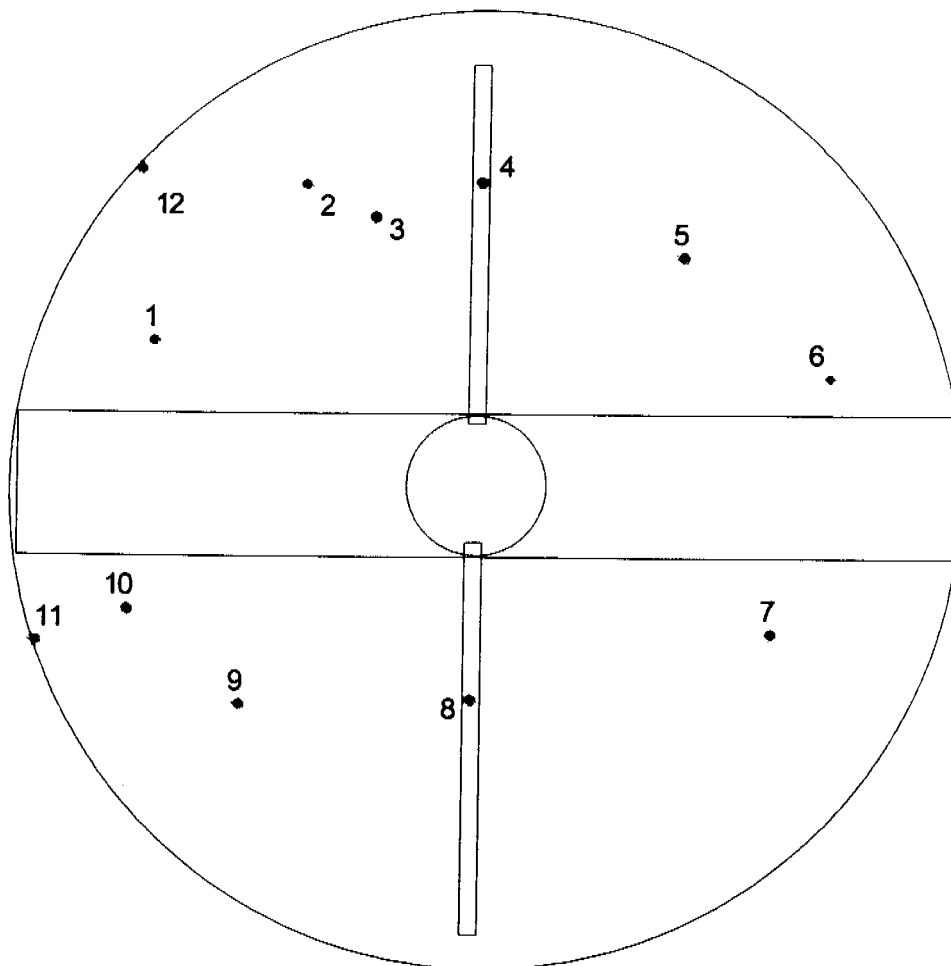
Clarifier Tank (top view): Removable Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Location of Removable Alpha Samples



- 0 - 20 dpm/100 cm² (Removable Alpha)
- ▲ > 20 dpm/100 cm² (Removable Alpha)



NOTE: Points 11 & 12 were sampled on the inside-top lip of tank.

Clarifier Tank (top view): Removable Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Location of Removable Beta/Gamma Samples



- 0 - 1000 dpm/100 cm² (Removable B/G)
- ▲ > 1000 dpm/100 cm² (Removable B/G)

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-207-02-CW

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu <input type="checkbox"/>	Enriched U <input type="checkbox"/>	Depleted U <input type="checkbox"/>	Natural U <input type="checkbox"/>	Other <input checked="" type="checkbox"/> (see comment section)
--------------------------------	-------------------------------------	-------------------------------------	------------------------------------	---

Contents of Characterization Survey Unit:

Catwalk

Location: Top and side of Clarifier Tank 207A

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample. Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

Note: RWP Required For Entry

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicon A-100 or appropriate instrumentation.
- Neglect background when calculating alpha and beta activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Prepared by: print Michalene Rodriguez
Radiological Engineersign Michalene Rodriguezdate 12-10-98Reviewed by: print John Millersign John Millerdate 12-14-98Approved by: print ESM/3/2005sign ESM/3/2005date 12/14/98

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-207-02-CW

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL/LCL
Alpha contamination	2.3	1.5	3.2	13.2
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	153.5	148.0	22.8	159.5

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL/LCL
Alpha contamination	147.2	75.0	159.7	189.7
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1192.6	1177.5	215.4	1250.0

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II _____ Subdivide and resample _____

Comments:

Prepared by Rad Eng print Michalene Rodriguez sign [Signature] date 1/4/99
 Reviewed by Rad Eng print John Miller sign [Signature] date 1-4-99
 Approved by print ESTABROOKS sign [Signature] date 1/5/99

SCO Statistical Analysis

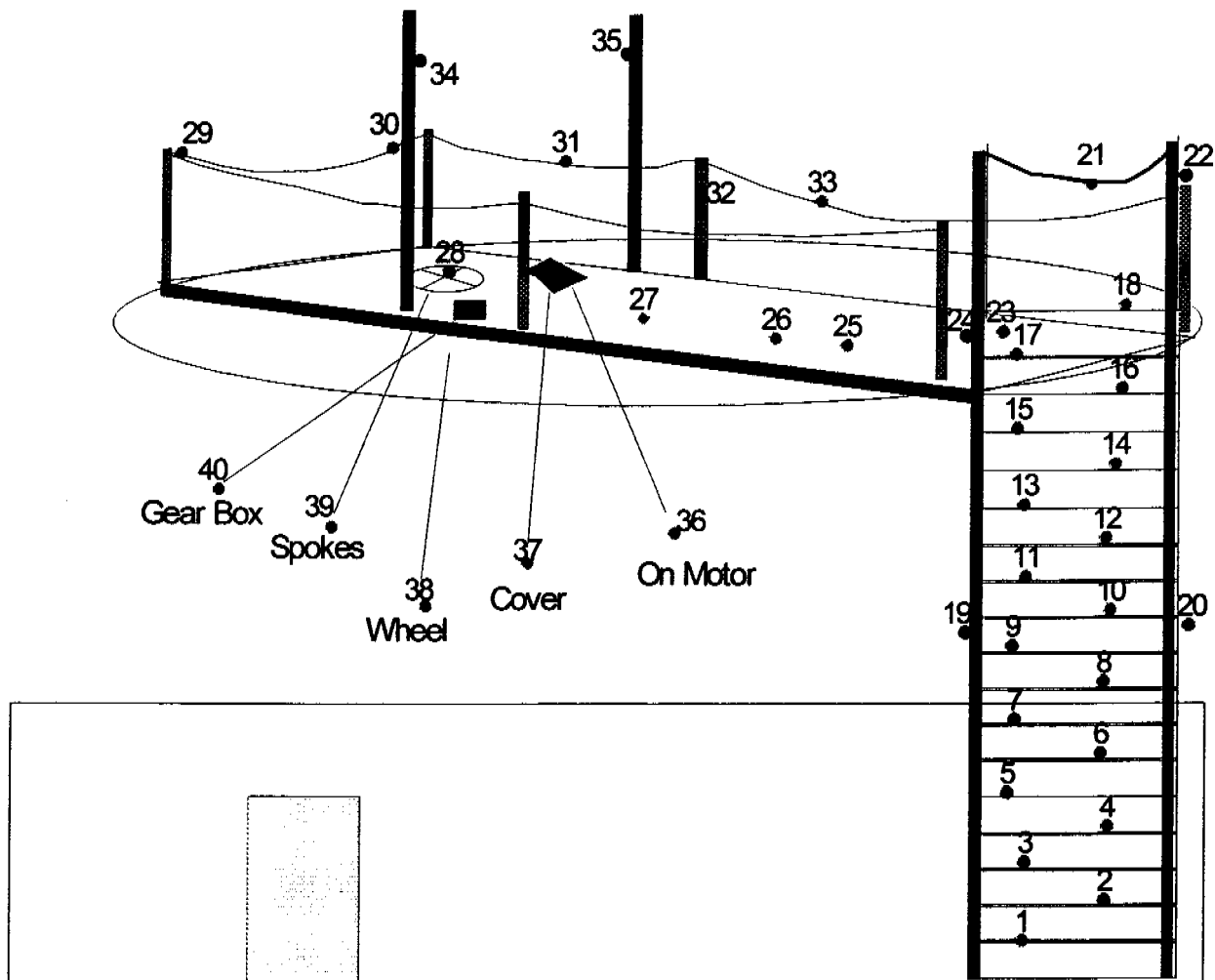
SCO-207-02-CW

Survey Unit:	SCO-207-02-CW			
Description:	Catwalk			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	30	156	1896
2	0	36	204	1671
3	9	18	132	1530
4	3	30	148	1443
5	3	42	172	1320
6	0	24	148	1293
7	0	24	148	1473
8	0	12	120	1209
9	3	42	152	1179
10	0	48	120	1113
11	0	36	132	1152
12	0	42	176	1212
13	3	54	172	1098
14	6	42	148	1104
15	0	66	144	1110
16	0	102	144	1113
17	0	66	144	1176
18	0	60	116	1176
19	0	42	180	1202
20	6	42	120	1020
21	6	84	180	804
22	3	138	164	915
23	0	150	132	1344
24	0	222	140	1314
25	3	162	144	1161
26	0	192	180	1224
27	3	510	144	1284
28	3	254	174	1113

SCO Statistical Analysis

SCO-207-02-CW

29	0	318	180	1290
30	3	204	144	1116
31	3	324	176	1218
32	0	360	164	1257
33	3	258	136	1260
34	6	786	136	1002
35	0	414	176	1290
36	0	102	112	891
37	3	60	196	1038
38	15	174	172	873
39	6	198	172	963
40	3	120	140	858
Size	40	40	40	40
Max.	15	786	204	1896
Mean	2.33	147.20	153.45	1192.63
Median	1.5	75	148	1177.5
Std. Deviation	3.15	159.68	22.77	215.37
UCL95	3.16	189.74	159.52	1250.00
RSP 09.05 SCO Tests:				
α Contamination				
	Max. removable < SCO I removable limit:	Yes		
	Max. total < SCO I total limit:	Yes		
	Median removable < 50% SCO I removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
	Max. removable < SCO II removable limit:	Yes		
	Max. total < SCO II total limit:	Yes		
	Median removable < 50% SCO II removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
β/γ Contamination				
	Max. removable < SCO I removable limit:	Yes		
	Max. total < SCO I total limit:	Yes		
	Median removable < 50% SCO I removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
	Max. removable < SCO II removable limit:	Yes		
	Max. total < SCO II total limit:	Yes		
	Median removable < 50% SCO II removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		



Clarifier Catwalk: Removable Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

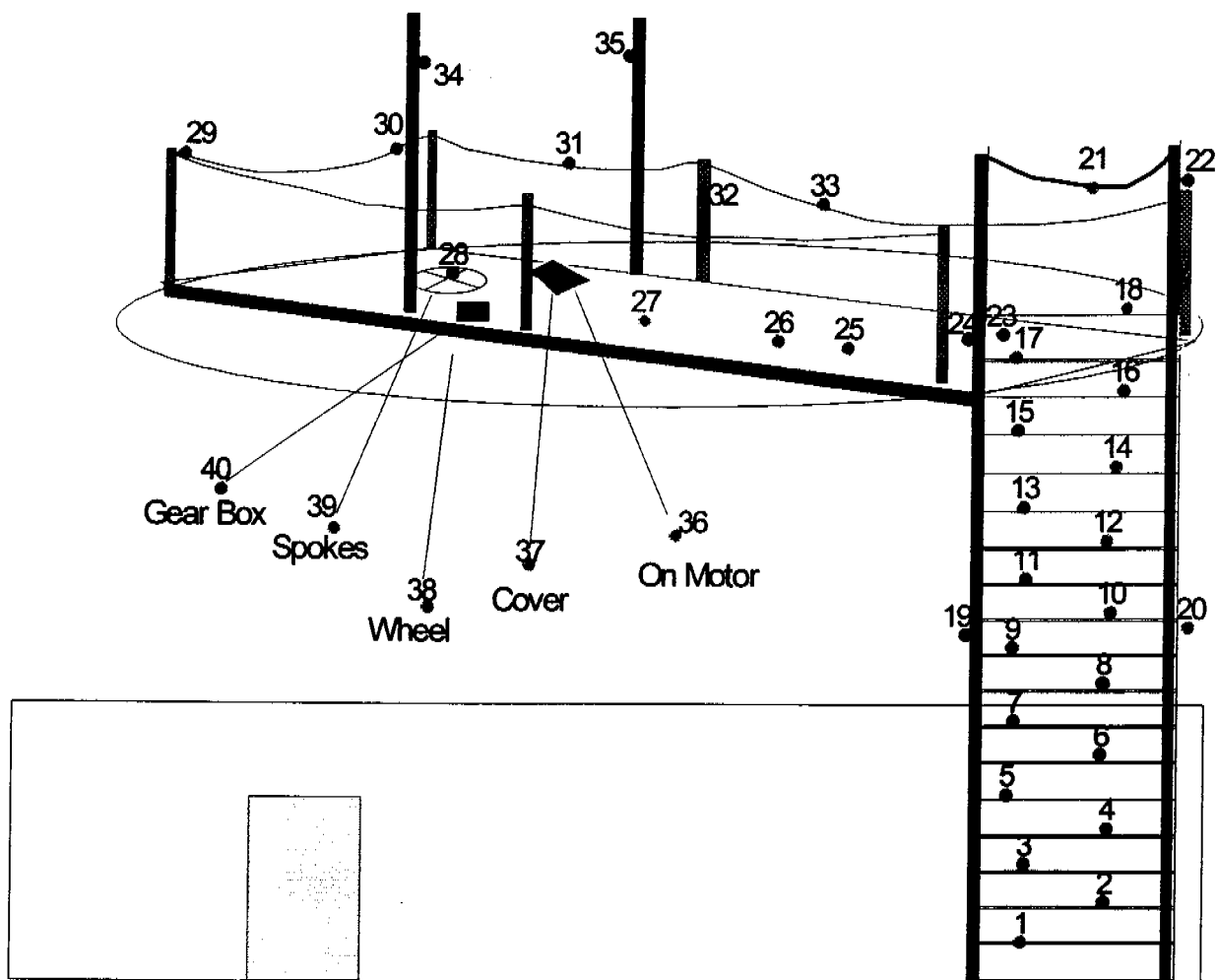
Approximate Locations of Removable Alpha Samples



0 - 20 dpm/100 cm² (Removable Alpha)



> 20 dpm/100 cm² (Removable Alpha)



Clarifier Catwalk: Removable Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Beta/Gamma Samples



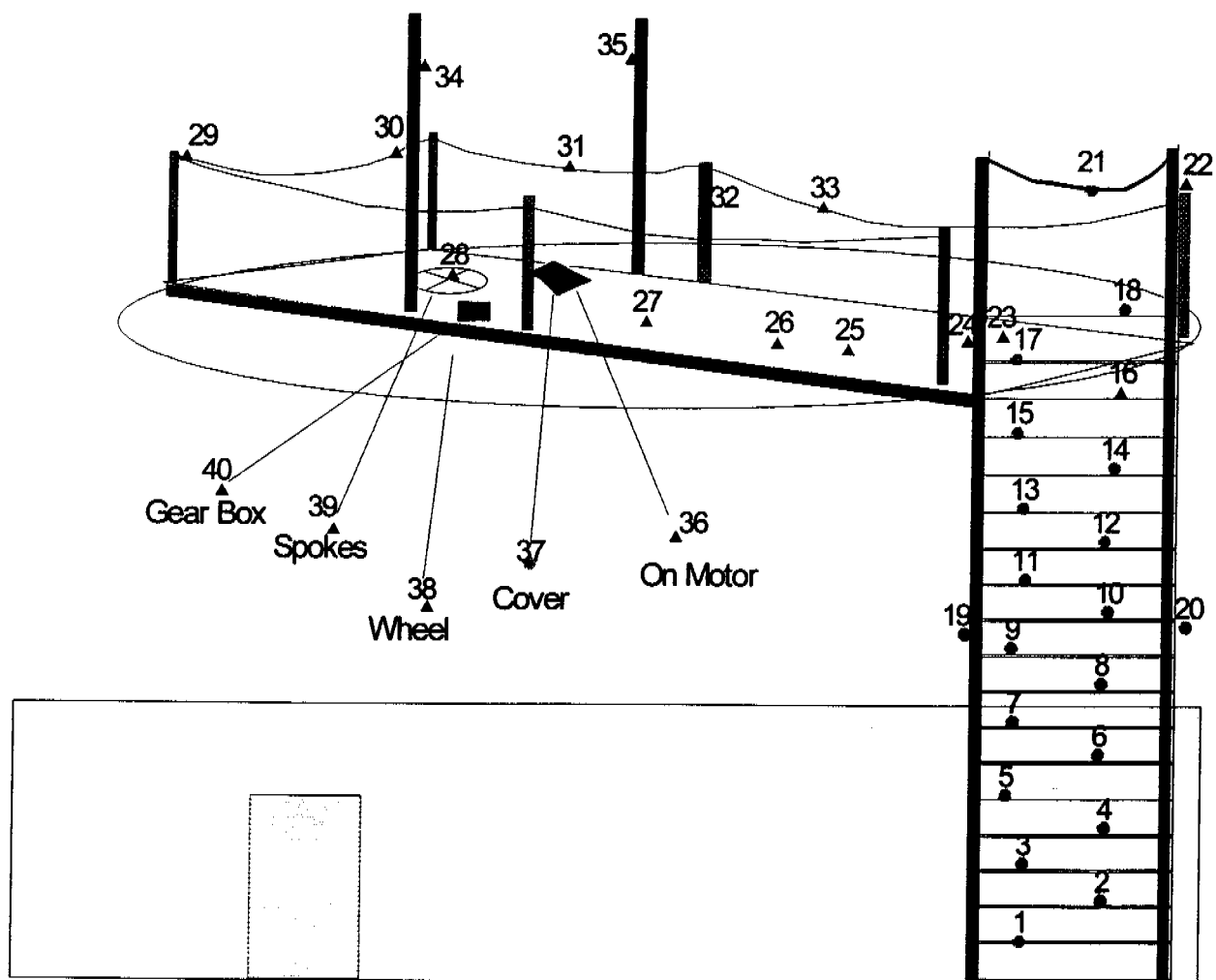
N



0 - 1000 dpm/100 cm² (Removable B/G)



> 1000 dpm/100 cm² (Removable B/G)



Clarifier Catwalk: Total Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

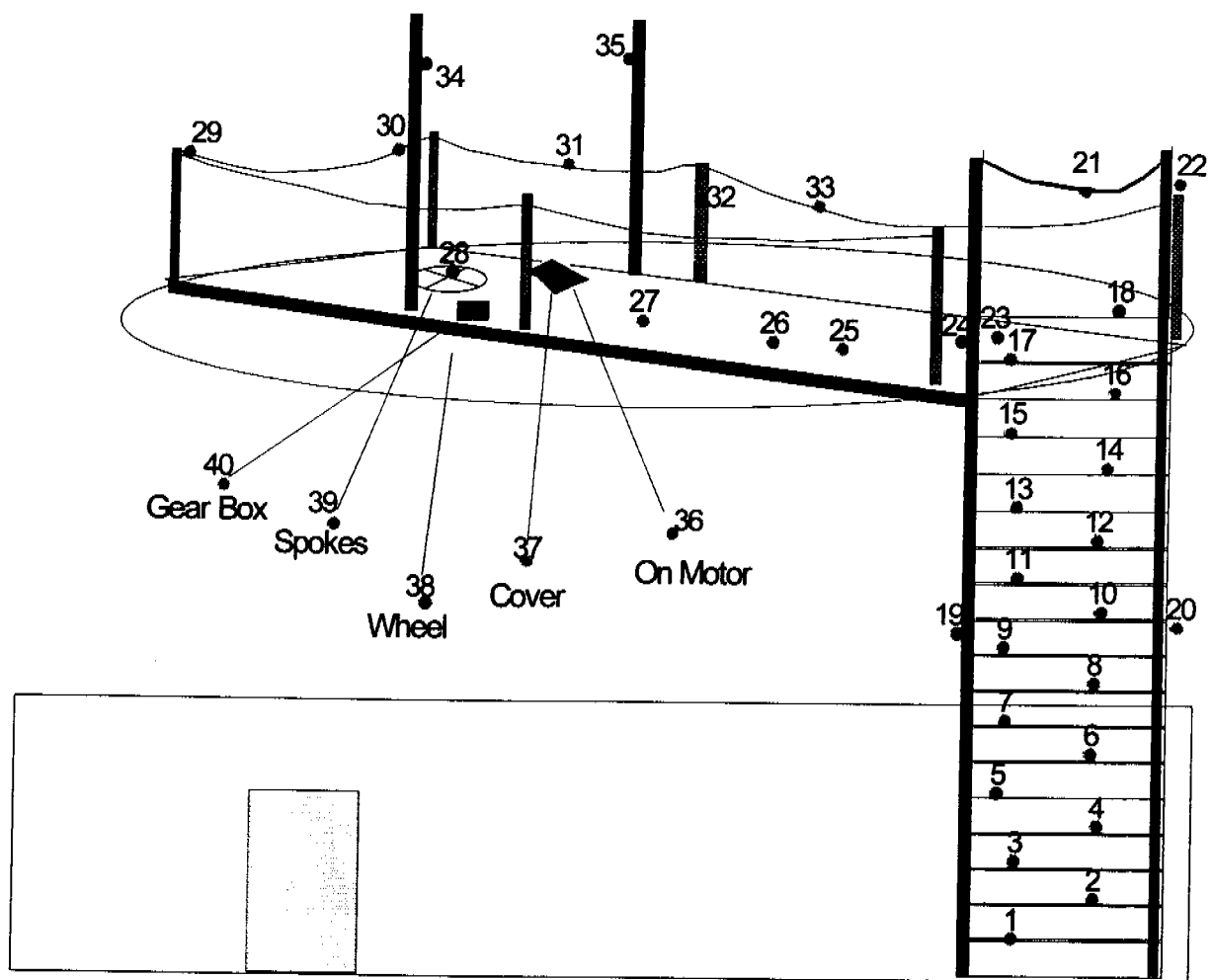
Approximate Locations of Total Alpha Samples



0 - 100 dpm/100 cm² (Total Alpha)



> 100 dpm/100 cm² (Total Alpha)



Clarifier Catwalk: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Total Beta/Gamma Samples



0 - 5000 dpm/100 cm² (Total B/G)



> 5000 dpm/100 cm² (Total B/G)

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-06-WE

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu ☐ Enriched U ☐ Depleted U ☐ Natural U ☐ Other ☒ (see comment section)

Contents of Characterization Survey Unit:

Exterior North, South, East, and West walls of Building 788

Location: Exterior of Building 788

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicron A-100 or appropriate instrumentation.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Michalene Rodriguez

Prepared by: print Radiological Engineer sign Michalene Rodriguez date 12-10-98Reviewed by: print John Miller sign John Miller date 12-14-98Approved by: print ESTABROOKS sign ESTABROOKS date 12/14/98

Each section of this form may be enlarged or continuation pages added as required

SCC-004D-02.418

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-06-WE

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	DOLE
Alpha contamination	8.4	20.0	9.2	9.5
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	171.4	200	30.4	175.4

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	DOLE
Alpha contamination	78.1	93.0	22.0	81.0
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1174.3	1114.5	226.0	1203.6

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II Subdivide and resample

Comments:

Prepared by Rad Eng print Michaelene RODRIGUEZ sign M. Rodriguez date 12/31/98
Reviewed by Rad Eng print John Miller sign John Miller date 12/31/98
Approved by print ESTABROOK sign Estabrook date 1/5/99

SCO Statistical Analysis

SCO-788-06-WE

Survey Unit:	SCO-788-06-WE			
Description:	Exterior North, West, East, and South Walls of Building 788			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	48	140	2238
2	0	114	180	2403
3	3	114	128	2229
4	0	78	164	1168
5	0	60	176	1173
6	9	66	172	1035
7	0	66	140	1110
8	6	90	172	1029
9	6	120	208	1152
10	0	138	184	1026
11	20	93	200	1311
12	20	108	200	1263
13	20	93	200	1404
14	20	93	200	1227
15	20	93	200	1209
16	20	93	200	1119
17	20	93	200	1239
18	20	93	200	1188
19	20	93	200	1104
20	20	93	200	1134
21	20	93	200	1065
22	20	108	200	990
23	20	93	200	957
24	20	93	200	999
25	20	93	200	990
26	20	93	200	969
27	20	93	200	981
28	20	96	200	972

SCO Statistical Analysis

SCO-788-06-WE

29		20	93	200	1221
30		20	93	200	1017
31		20	93	200	1194
32		20	93	200	927
33		20	93	200	1167
34		20	108	200	942
35		20	114	200	1242
36		20	93	200	927
37		20	93	200	1170
38		20	96	200	1029
39		20	93	200	1029
40		20	93	200	930
41		3	78	108	954
42		3	66	156	951
43		0	78	184	954
44		0	48	176	957
45		3	78	136	948
46		0	36	172	906
47		0	54	128	909
48		0	66	176	996
49		0	48	132	894
50		3	60	132	1263
51		0	72	156	1419
52		0	60	144	1386
53		3	48	152	1452
54		0	54	184	1512
55		0	54	124	1245
56		0	78	140	1257
57		3	42	112	1311
58		6	72	140	1380
59		6	54	144	1218
60		0	66	176	1332
61		0	66	192	1293
62		3	60	132	1314
63		0	102	136	1251
64		0	30	168	1377
65		3	54	144	1410
66		3	54	136	1317
67		0	90	176	1341
68		0	48	160	1317
69		3	48	160	1416
70		0	90	172	1464
71		0	72	180	1326
72		0	60	140	1278
73		0	54	152	1233
74		0	30	100	1155
75		3	54	148	1275
76		0	48	124	1284
77		9	18	212	1122
78		3	60	192	1650
79		0	42	156	1080

SCO Statistical Analysis

SCO-788-06-WE

80	0	36	152	1050
81	3	60	156	996
82	0	30	112	1062
83	0	96	172	1224
84	12	36	136	1173
85	20	54	200	1206
86	20	90	200	1104
87	20	84	200	1032
88	20	84	200	1089
89	20	60	200	1266
90	20	54	200	1182
91	0	90	148	1077
92	0	54	100	960
93	0	108	124	996
94	0	84	120	1023
95	0	102	196	927
96	0	78	128	876
97	0	54	224	867
98	0	72	156	1056
99	0	72	172	1137
100	0	72	168	1290
101	3	90	148	1179
102	0	66	180	1278
103	0	90	144	1404
104	3	66	124	1437
105	0	72	164	1194
106	0	72	140	1395
107	3	60	136	1170
108	0	126	148	1326
109	20	93	200	1197
110	20	93	200	1335
111	20	93	200	1203
112	20	93	200	1197
113	20	93	200	1050
114	20	93	200	990
115	20	93	200	1026
116	20	93	200	1011
117	20	93	200	957
118	20	93	200	1026
119	20	93	200	957
120	20	93	200	1287
121	20	93	200	1224
122	20	93	200	1236
123	20	93	200	1278
124	20	93	200	918
125	20	93	200	927
126	20	93	200	930
127	20	93	200	829
128	20	93	200	948
129	20	93	200	963
130	20	93	200	1017

SCO Statistical Analysis

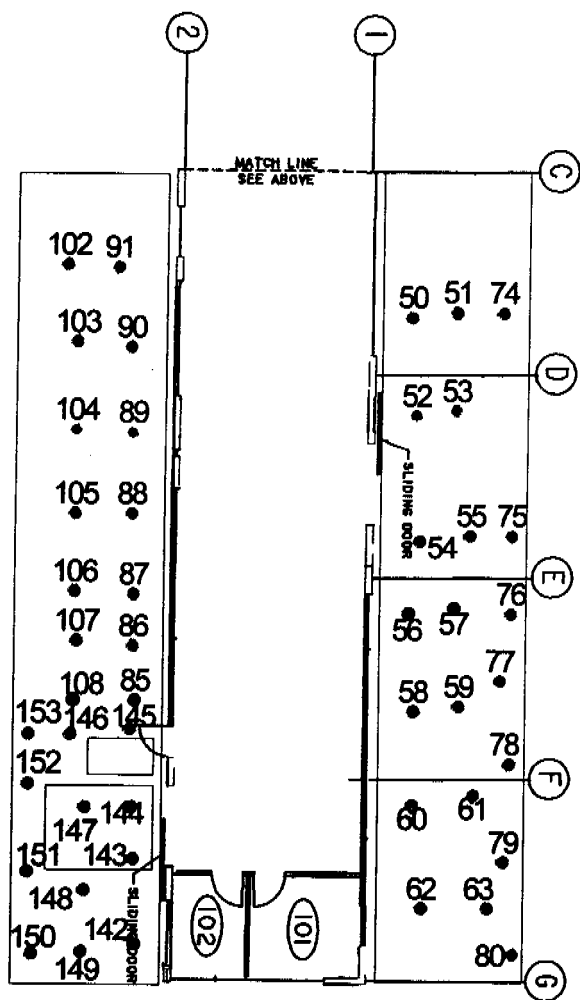
SCO-788-06-WE

131	20	93	200	951
132	20	93	200	972
133	3	60	164	1131
134	0	72	160	1233
135	0	102	192	1182
136	0	96	176	1386
137	3	54	184	1203
138	9	78	172	1170
139	3	84	192	1107
140	6	72	152	1131
141	9	54	144	1095
142	0	54	148	1302
143	0	66	176	1233
144	0	72	148	1173
145	0	48	164	1095
146	3	54	164	1401
147	0	102	164	1368
148	0	102	116	1395
149	0	78	160	1413
150	0	78	160	1236
151	0	96	200	1032
152	0	84	160	984
153	3	96	132	1146
154	0	54	124	1422
155	3	54	112	1107
156	0	66	176	1545
157	0	108	184	1353
158	0	90	120	1041
159	3	48	132	1026
160	0	42	108	1017
161	6	54	104	984
162	6	108	196	1071
163	0	108	196	1392
Size	163	163	163	163
Max.	20	138	224	2403
Mean	8.36	78.07	171.44	1174.26
Median	20	93	200	1114.5
Std. Deviation	9.15	22.03	30.40	225.99
UCL95	9.54	80.93	175.38	1203.55
RSP 09.05 SCO Tests:				
α Contamination				
	Max. removable < SCO I removable limit:		Yes	
	Max. total < SCO I total limit:		Yes	
	Median removable < 50% SCO I removable limit:		Yes	
	Median total < 50% SCO I total limit:		Yes	

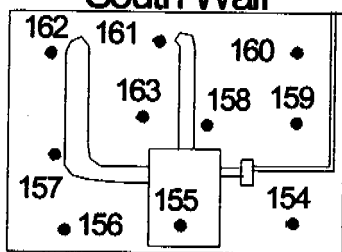
SCO Statistical Analysis

SCO-788-06-WE

Max. removable < SCO II removable limit:	Yes	
Max. total < SCO II total limit:	Yes	
Median removable < 50% SCO II removable limit:	Yes	
Median total < 50% SCO I total limit:	Yes	
β/γ Contamination		
Max. removable < SCO I removable limit:	Yes	
Max. total < SCO I total limit:	Yes	
Median removable < 50% SCO I removable limit:	Yes	
Median total < 50% SCO I total limit:	Yes	
Max. removable < SCO II removable limit:	Yes	
Max. total < SCO II total limit:	Yes	
Median removable < 50% SCO II removable limit:	Yes	
Median total < 50% SCO I total limit:	Yes	



South Wall

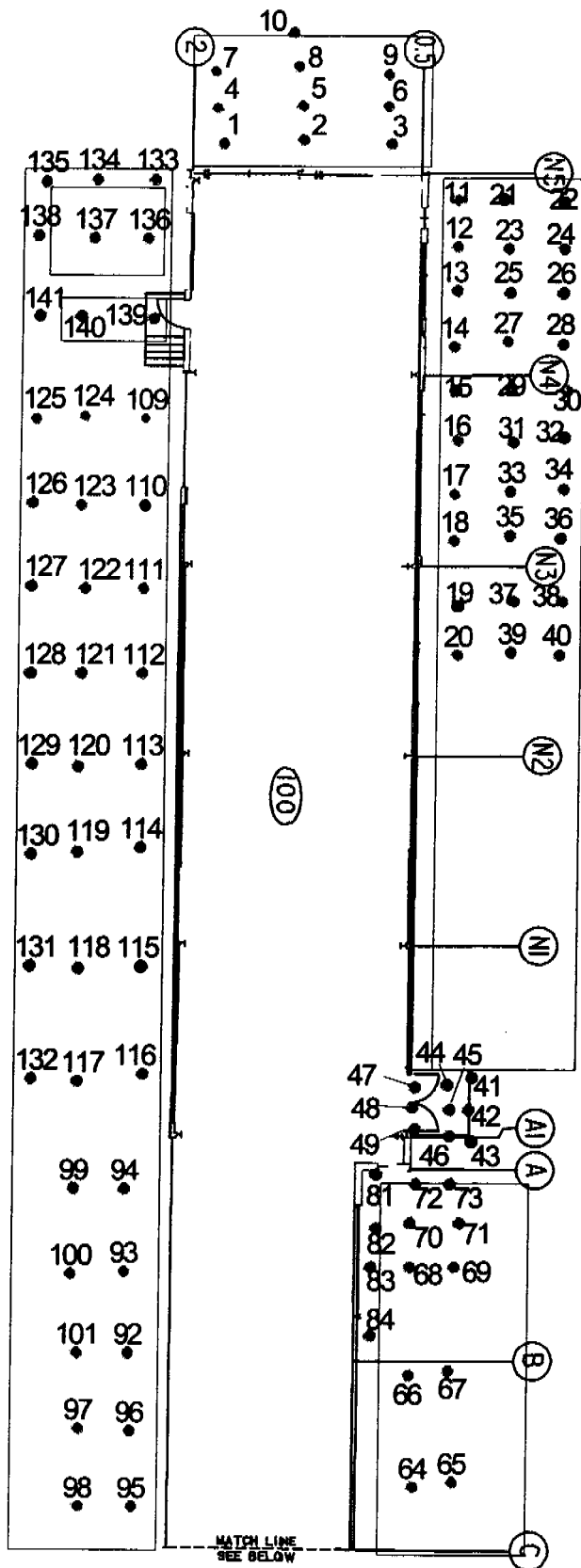


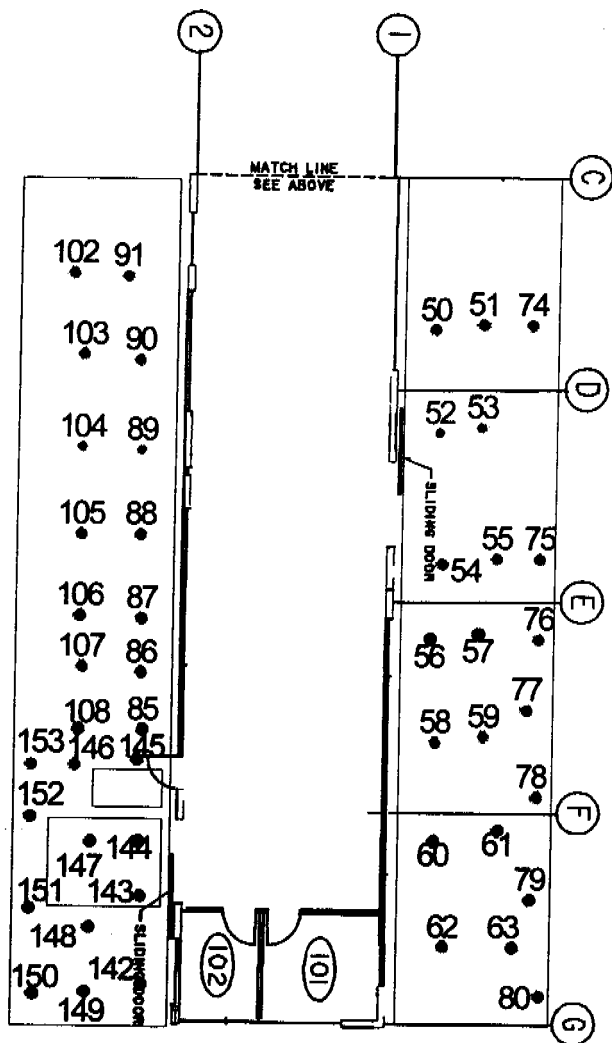
B788 Exterior Walls

Approximate Locations of
Removable Alpha Samples

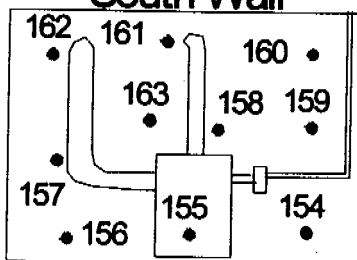


- 0 - 20 dpm/100 cm²
- ▲ > 20 dpm/100 cm²



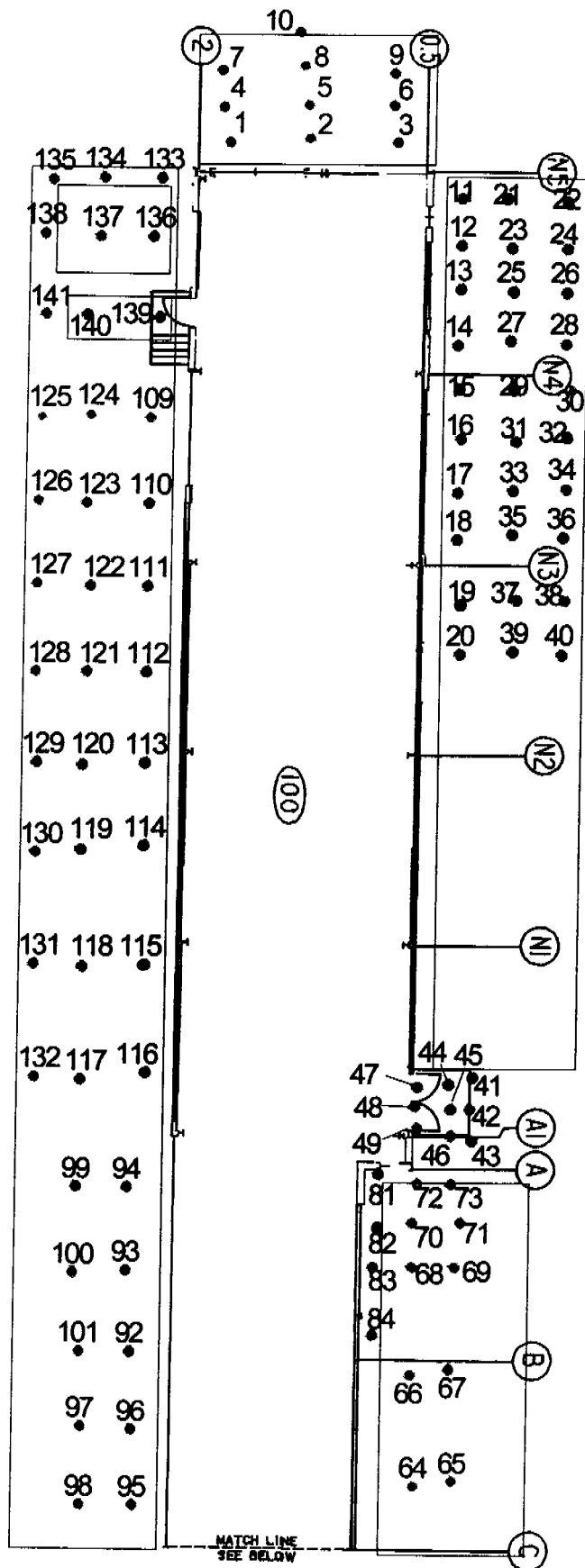
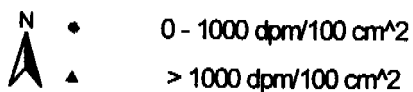


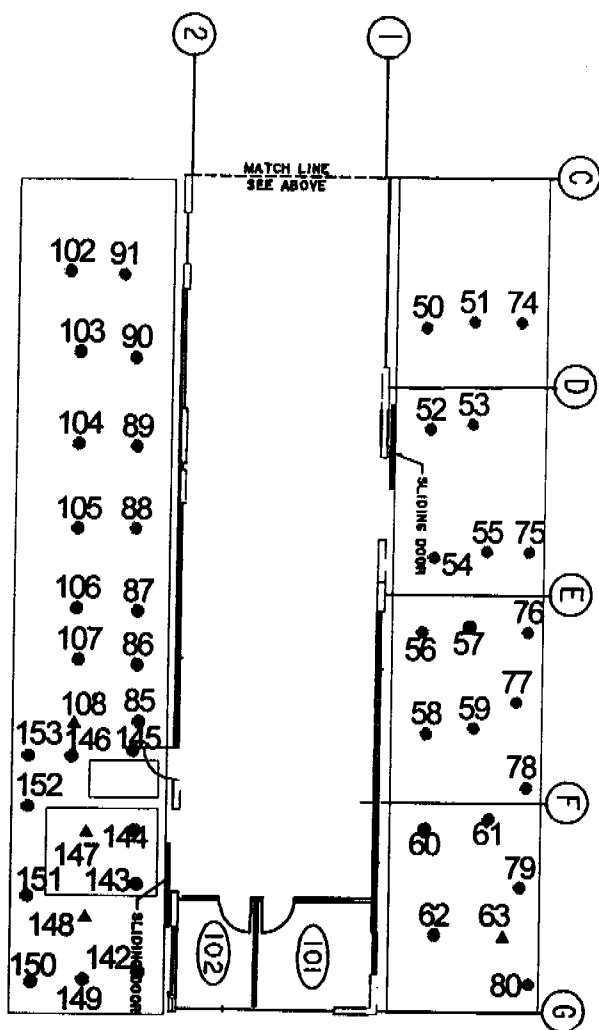
South Wall



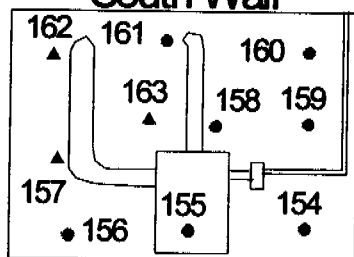
B788 Exterior Walls

Approximate Locations of
Removable Beta/Gamma





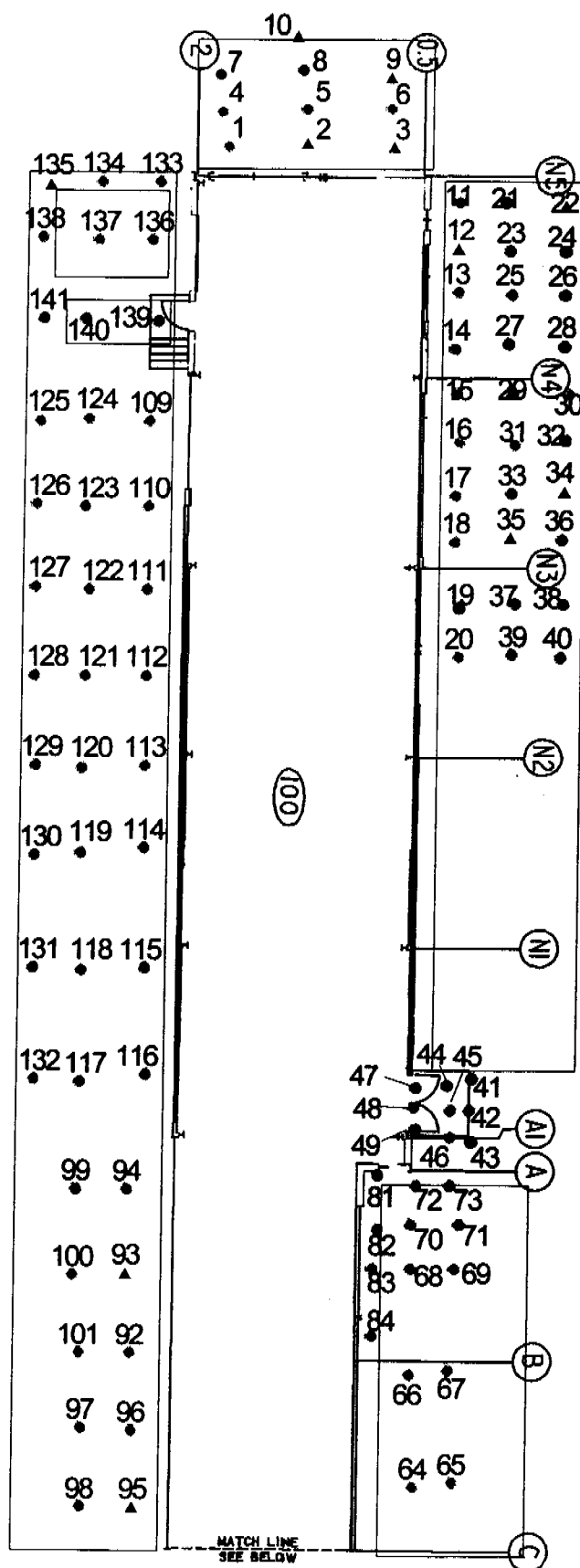
South Wall

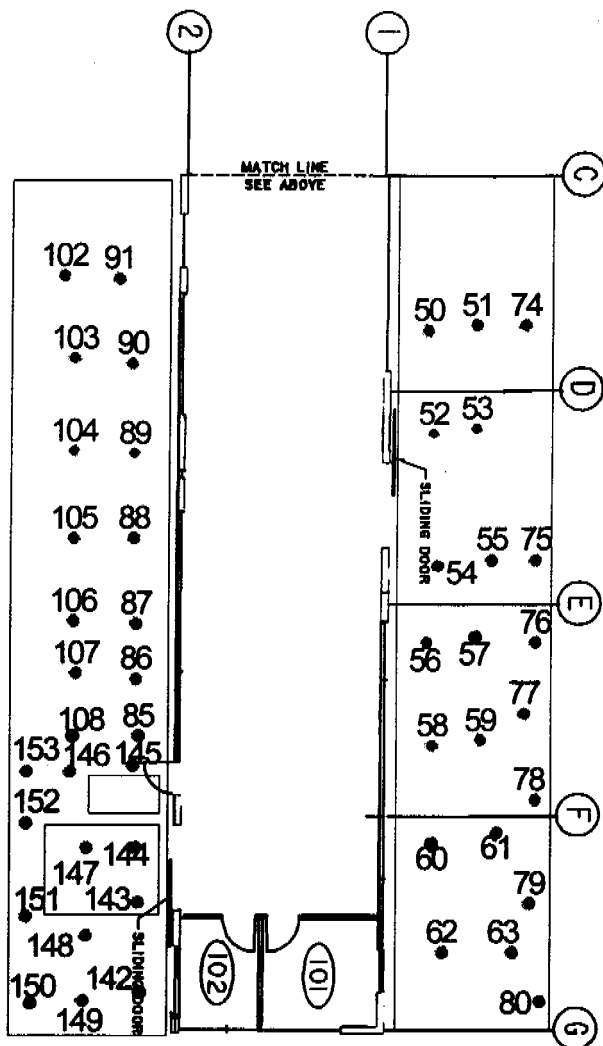


B788 Exterior Walls

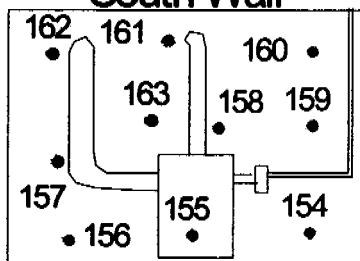
Approximate Locations of
Total Alpha Samples

- N
- 0 - 100 dpm/100 cm²
 - ▲ > 100 dpm/100 cm²



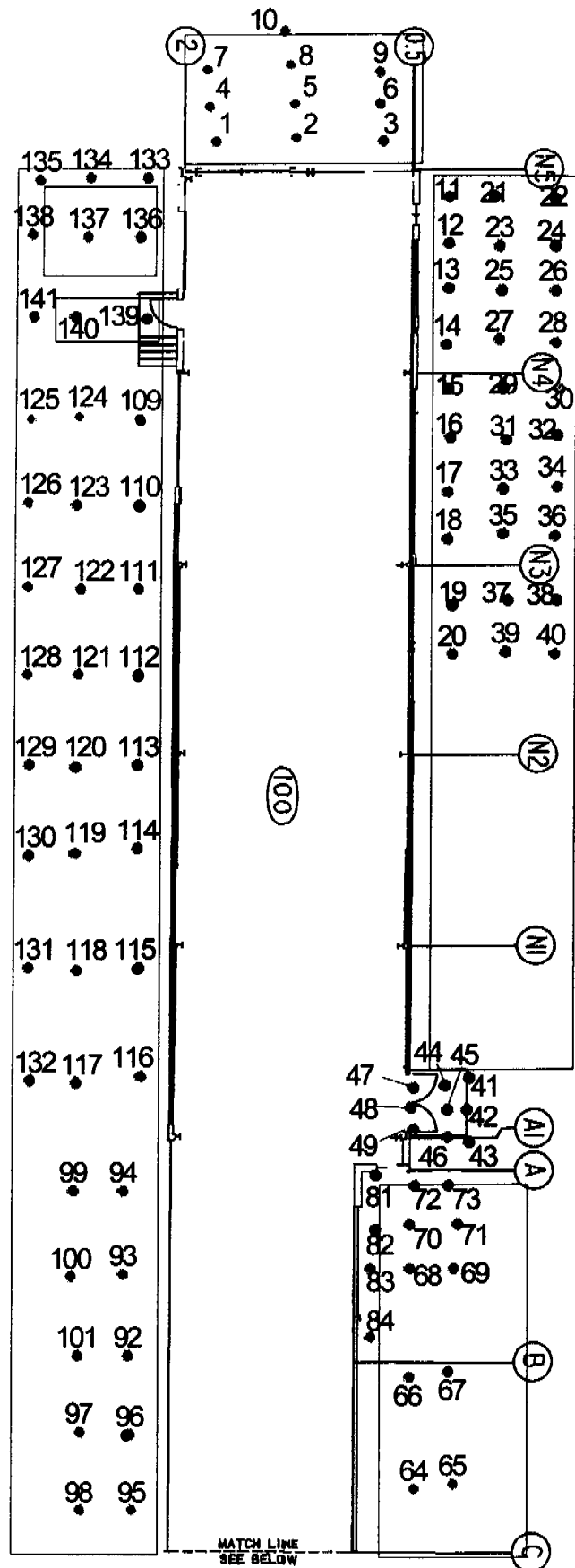
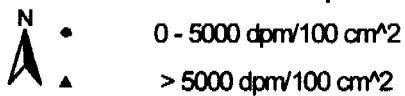


South Wall



B788 Exterior Walls

Approximate Locations of
Total Beta/Gamma Samples



RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-07-RE

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu <input type="checkbox"/>	Enriched U <input type="checkbox"/>	Depleted U <input type="checkbox"/>	Natural U <input type="checkbox"/>	Other <input checked="" type="checkbox"/> (see comment section)
--------------------------------	-------------------------------------	-------------------------------------	------------------------------------	---

Contents of Characterization Survey Unit:

Exterior Roof

Location: Building 788

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicorn A-100 or appropriate instrumentation.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Prepared by: print Michalene Rodriguez sign [Signature] date 12-10-98

Reviewed by: print [Signature] sign [Signature] date 12-14-98

Approved by: print ESTASZROOKS sign [Signature] date 12/14/98

Each section of this form may be enlarged, or continuation pages added, as required.

SCO-CHAR-98-418

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-07-RE

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL 95
Alpha contamination	6.6	3.0	7.2	7.8
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	170.2	168.0	27.7	174.9

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL 95
Alpha contamination	121.2	90.0	107.6	139.5
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1368.6	1332.0	248.8	1411.0

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II Subdivide and resample

Comments:

Prepared by Rad Eng print Michaelene Rodriguez sign M. Rodriguez date 12/31/98
 Reviewed by Rad Eng print John I. Miller sign John I. Miller date 1-4-99
 Approved by print ESTANBROOKS sign Estan Brooks date 1/5/99

Survey Unit:	SCO-788-07-RE			
Description:	Exterior Roof - Building 788			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
$t_{1/2}$ (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm ²)	Max. Total Activity (α) (dpm/100cm ²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm ²)	Max. Total Activity (β/γ) (dpm/100cm ²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
	Removable α Activity (dpm/100cm ²)	Total α Activity (dpm/100cm ²)	Removable β/γ Activity (dpm/100cm ²)	Total β/γ Activity (dpm/100cm ²)
Survey Point				
1	0	108	144	1278
2	0	78	144	1281
3	0	96	152	1281
4	0	96	152	1353
5	3	60	160	1428
6	0	72	176	1308
7	3	66	212	1302
8	0	108	112	1542
9	0	72	160	1392
10	3	54	176	1239
11	3	78	148	1350
12	3	42	132	1293
13	6	60	148	1281
14	6	48	148	1293
15	6	96	200	1356
16	3	66	152	1470
17	3	78	164	1194
18	0	90	164	1299
19	3	84	156	1074
20	20	90	200	1272
21	20	66	200	1164
22	20	102	200	1101
23	20	108	200	1017
24	20	96	200	1176
25	20	66	200	1098
26	20	66	200	1119
27	20	84	200	1253
28	20	90	200	1149

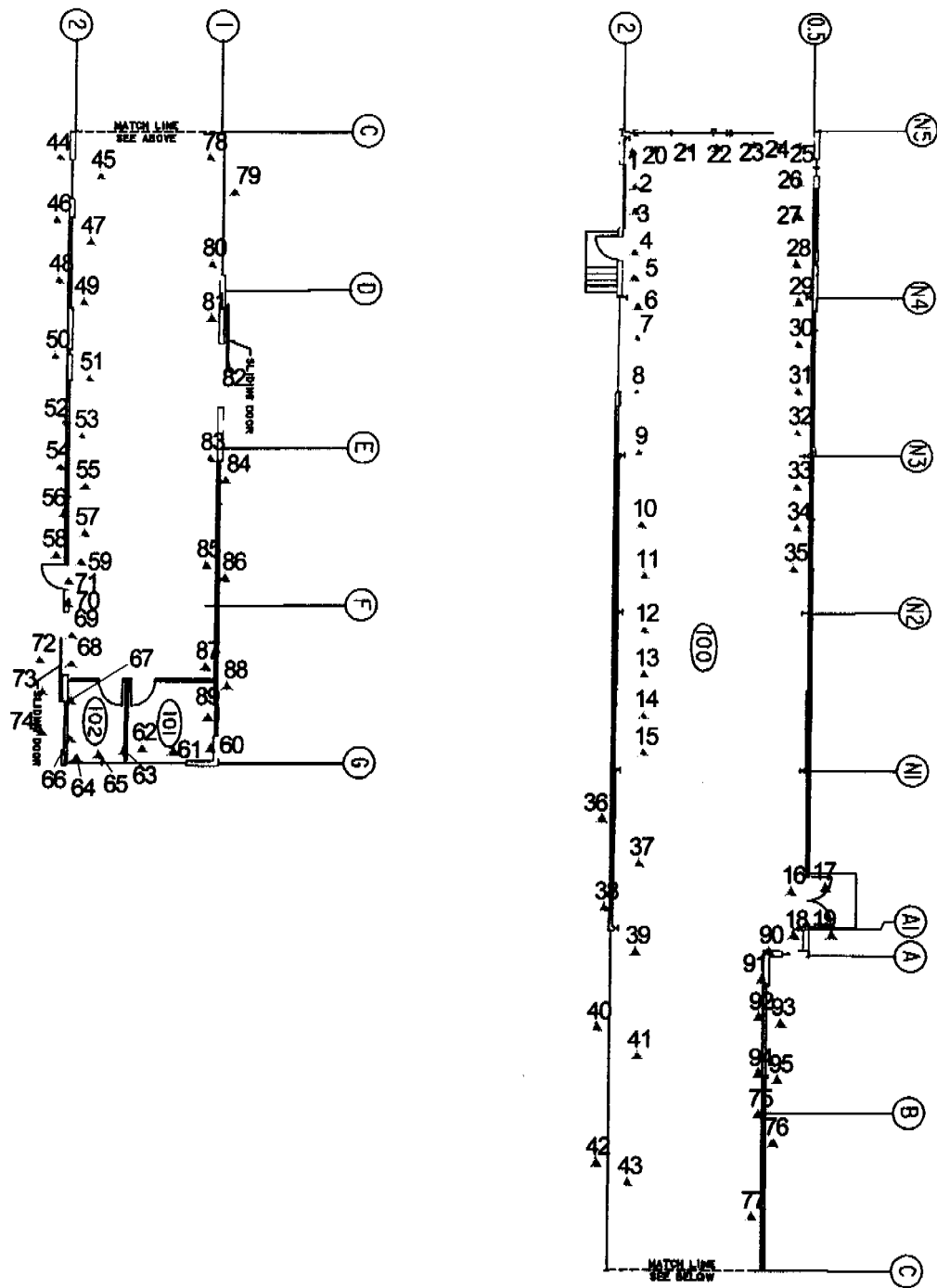
SCO Statistical Analysis

SCO-788-07-RE

29	20	120	200	1194
30	20	96	200	1140
31	20	66	200	1284
32	20	144	200	936
33	20	114	200	1209
34	20	102	200	1188
35	20	66	200	1191
36	3	60	188	960
37	0	90	156	1113
38	6	150	192	1299
39	0	30	148	1167
40	0	84	128	1020
41	3	48	136	1155
42	3	72	216	1002
43	0	96	172	1224
44	12	42	188	1053
45	0	54	184	1290
46	0	48	100	1125
47	12	210	200	1497
48	3	54	148	1128
49	12	228	172	1458
50	0	66	192	1125
51	12	156	236	1557
52	0	48	116	1086
53	3	30	188	1470
54	3	114	196	1164
55	15	198	168	1416
56	0	60	156	1074
57	0	174	128	1452
58	3	42	136	1218
59	0	240	184	1479
60	6	264	216	1602
61	9	246	164	1677
62	0	210	168	1674
63	3	192	144	1644
64	9	246	176	1824
65	6	162	156	1512
66	15	945	204	1620
67	6	54	168	2436
68	18	168	148	1626
69	6	180	168	1821
70	6	48	180	1689
71	3	240	188	1821
72	3	174	168	1632
73	12	72	184	1575
74	3	72	184	1692
75	0	144	144	1455
76	3	48	128	1266
77	0	186	124	1482
78	6	288	156	1476
79	0	84	164	1491

SCO Statistical Analysis

[illegible]

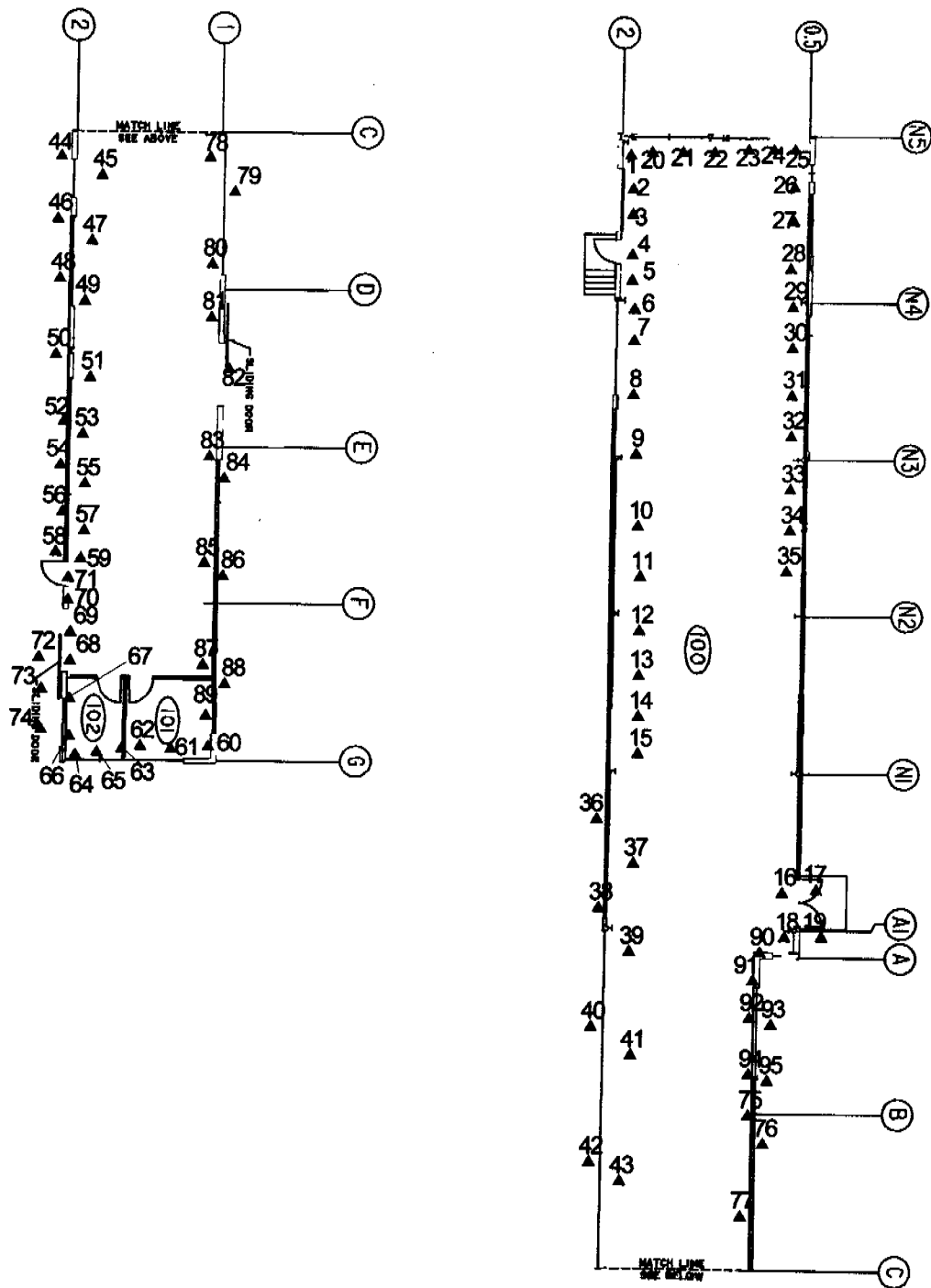


B788 Roof Samples: Removable Alpha

(Note: Drawing not to scale. All dimensions are approximate.)
Approximate Locations of Removable Alpha Samples

- 0 - 20 dpm/100 cm² (Removable Alpha)
- ▲ > 20 dpm/100 cm² (Removable Alpha)





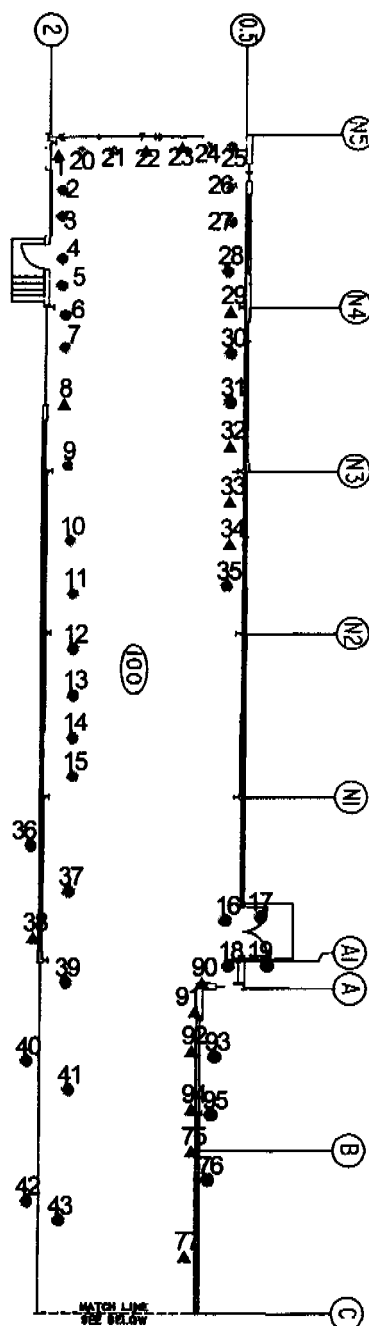
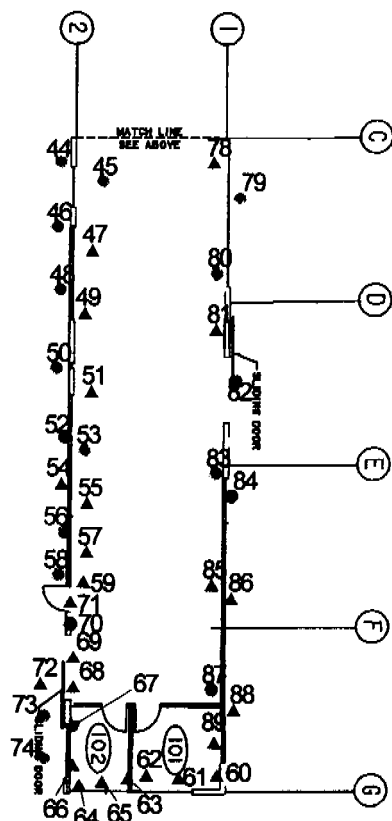
B788 Roof Samples: Removable Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Beta/Gamma Samples



● 0 - 1000 dpm/100 cm² (Removable B/G)
 ▲ > 1000 dpm/100 cm² (Removable B/G)



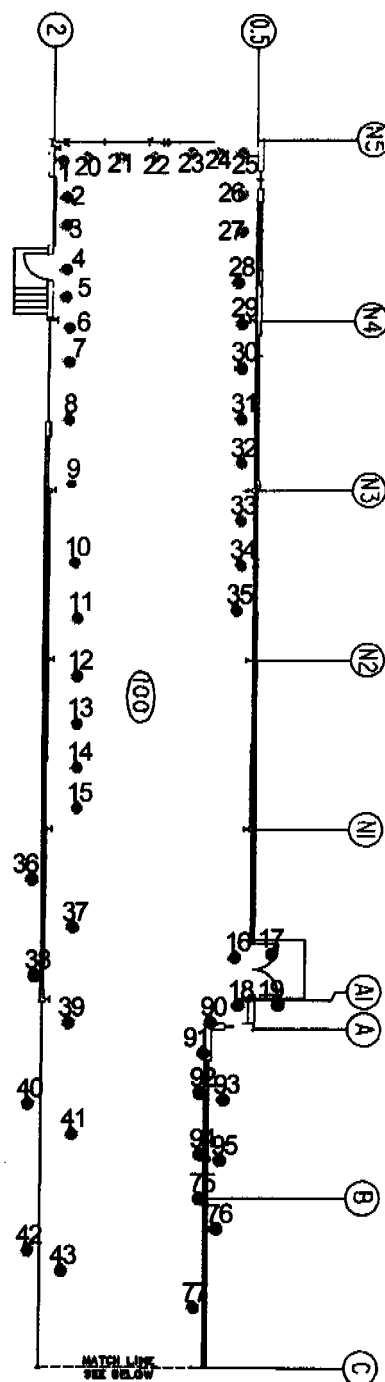
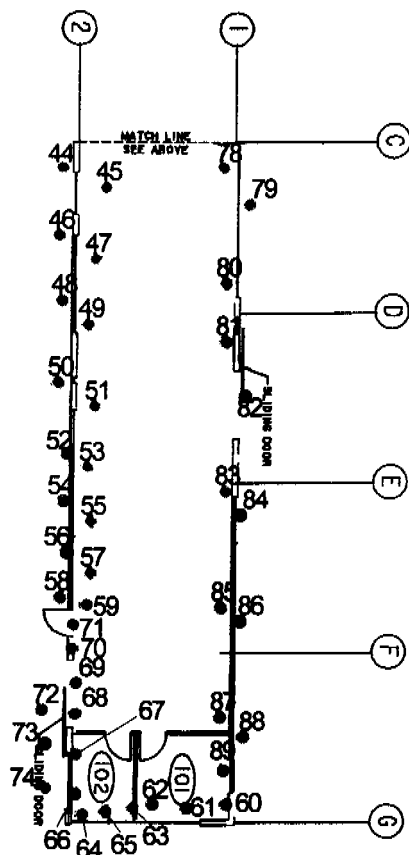
B788 Roof Samples: Total Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Location of Total Alpha Samples



- 0 - 100 dpm/100 cm² (Total Alpha)
- ▲ > 100 dpm/100 cm² (Total Alpha)



B788 Roof Samples: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Total Beta/Gamma Samples

- 0 - 1000 dpm/100 cm² (Total B/G)
- ▲ > 1000 dpm/100 cm² (Total B/G)



RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-01-WI

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu <input type="checkbox"/>	Enriched U <input type="checkbox"/>	Depleted U <input type="checkbox"/>	Natural U <input type="checkbox"/>	Other <input checked="" type="checkbox"/> (see comment section)
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Contents of Characterization Survey Unit:

Interior North, South, East, and West walls of Building 788 (to include structural uprights)

(This does not include the Contamination Control Room)

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicorn A-100.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Michalene Rodriguez

Prepared by: print Radiological Engineer sign Michalene Rodriguez date 12-10-98Reviewed by: print John Miller sign John Miller date 12-14-98Approved by: print ESTABROOK sign W. Estabrook date 12/14/98

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-01-WI

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCLOS
Alpha contamination	5.0	3.0	4.5	5.5
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	162.0	160.0	25.6	165.2

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCLOS
Alpha contamination	70.0	66.0	37.7	74.7
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1154.9	1174.5	214.3	1181.1

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II _____ Subdivide and resample _____

Comments:

Prepared by Rad Eng print Michalene Rodriguez sign [Signature] date 1/5/99
 Reviewed by Rad Eng print John Miller sign [Signature] date 1-5-99
 Approved by print ES MARROKS sign [Signature] date 1/5/99

SCO Statistical Analysis

SCO-788-01-WI

Survey Unit:	SCO-788-01-WI			
Description:	Interior North, South, East, and West Walls of Building 788			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	90	180	1350
2	9	66	184	1440
3	9	102	200	1352
4	3	144	152	1549
5	6	78	136	1338
6	3	72	204	1326
7	6	90	164	1305
8	3	54	136	1305
9	3	90	184	1365
10	3	72	168	1419
11	3	90	176	1554
12	9	102	176	1347
13	0	60	184	1454
14	15	54	128	1374
15	9	102	160	1419
16	9	54	188	1269
17	0	114	154	1563
18	0	78	168	1377
19	3	54	116	1143
20	0	30	168	1152
21	6	12	184	1200
22	0	30	144	1245
23	3	6	160	1053
24	3	30	200	1071
25	6	30	156	1041
26	0	30	156	1131
27	3	42	128	1023
28	0	6	176	1032

29	0	60	192	1221
30	0	54	164	1272
31	0	60	156	1248
32	0	30	156	1311
33	3	60	164	1272
34	0	6	104	1311
35	3	48	136	1110
36	3	90	140	1200
37	0	60	156	1257
38	3	36	124	1173
39	0	36	152	1243
40	3	54	116	1224
41	15	120	160	1215
42	0	66	160	945
43	0	121	164	1137
44	6	180	184	1248
45	9	66	144	900
46	6	96	140	1020
47	3	42	168	948
48	3	114	148	969
49	6	90	136	951
50	3	132	212	978
51	12	150	188	1188
52	9	174	156	1425
53	0	96	168	1335
54	12	168	192	978
55	3	60	156	990
56	12	132	184	807
57	3	54	132	1017
58	12	78	164	777
59	12	78	196	1134
60	9	48	124	888
61	3	234	158	1254
62	9	84	172	1020
63	6	66	192	1062
64	0	66	208	999
65	6	66	168	1098
66	0	66	164	789
67	6	60	172	1131
68	0	72	144	1020
69	3	60	176	1155
70	15	42	180	945
71	3	36	152	846
72	15	72	136	1077
73	6	90	160	1350
74	3	90	92	1212
75	12	54	176	1305
76	12	54	176	1095
77	9	72	196	1005
78	9	78	164	1218
79	9	78	188	1404

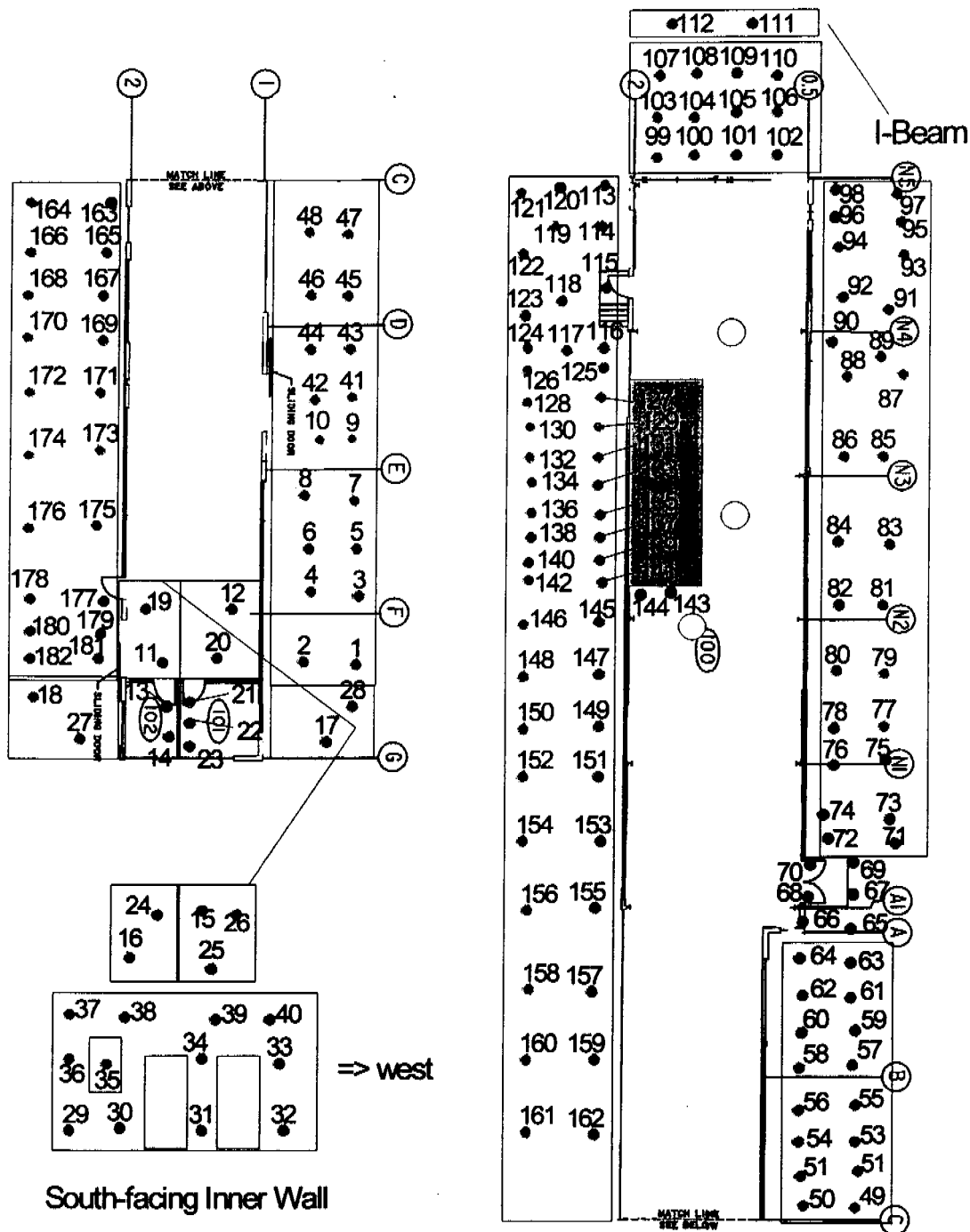
80	15	132	180	1212
81	15	84	184	1392
82	12	132	168	1212
83	15	66	204	1314
84	9	72	120	1359
85	9	78	196	1416
86	3	66	196	1218
87	15	42	196	1410
88	6	42	148	1260
89	3	84	152	1551
90	9	30	200	1119
91	3	60	196	1440
92	15	72	264	1176
93	3	120	172	1074
94	9	126	180	1071
95	9	84	196	1088
96	9	72	152	1293
97	9	66	192	1098
98	18	42	188	1314
99	6	30	184	207
100	0	150	148	1029
101	6	156	200	1065
102	3	66	136	963
103	0	72	142	960
104	0	42	196	984
105	0	42	140	645
106	0	24	148	891
107	3	24	176	903
108	6	54	144	840
109	0	24	168	921
110	12	54	128	903
111	0	78	152	807
112	0	48	152	792
113	6	42	120	963
114	3	72	188	330
115	0	36	156	600
116	12	48	176	987
117	3	72	200	654
118	6	84	132	1005
119	3	48	180	1104
120	0	60	188	1038
121	0	42	100	930
122	6	54	172	1059
123	3	66	144	948
124	6	54	136	1059
125	3	66	144	1326
126	3	60	112	1068
127	0	54	180	1077
128	3	102	132	1128
129	3	48	124	1193
130	3	48	152	1188

131	3	18	152	1194
132	0	42	144	1167
133	0	30	164	1080
134	3	60	152	1074
135	3	90	184	927
136	3	66	168	1011
137	0	60	160	1227
138	6	78	132	1047
139	3	12	148	693
140	3	114	156	1080
141	0	54	160	1041
142	3	54	124	1164
143	0	72	136	1095
144	9	30	152	1059
145	9	84	172	1176
146	0	60	164	1098
147	12	66	160	1371
148	3	66	224	1023
149	9	90	152	1116
150	3	78	132	1218
151	3	78	144	1143
152	6	72	188	1206
153	3	24	188	1242
154	9	60	168	1242
155	3	42	196	1437
156	0	90	160	1263
157	12	54	152	1422
158	6	78	144	1422
159	3	54	144	1299
160	9	42	164	1329
161	6	66	180	1527
162	3	72	136	1275
163	0	54	128	1239
164	12	60	200	1302
165	3	54	160	1410
166	3	78	160	1233
167	0	66	192	1488
168	6	102	116	1278
169	3	54	144	1356
170	15	66	128	1314
171	6	216	152	1206
172	0	90	144	1173
173	6	24	176	1308
174	3	96	156	1068
175	3	36	128	1242
176	3	60	176	1119
177	3	36	160	1242
178	0	48	148	1299
179	3	42	140	1500
180	9	54	164	1299
181	6	48	188	1341

SCO Statistical Analysis

SCO-788-01-WI

182	9	234	156	1644
Size	182	182	182	182
Max.	18	234	264	1644
Mean	4.96	70.03	162.03	1154.86
Median	3	66	160	1174.5
Std. Deviation	4.46	37.71	25.60	214.32
UCL95	5.51	74.65	165.17	1181.13
RSP 09.05 SCO Tests:				
α Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
Max. removable < SCO II removable limit:		Yes		
Max. total < SCO II total limit:		Yes		
Median removable < 50% SCO II removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
β/γ Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
Max. removable < SCO II removable limit:		Yes		
Max. total < SCO II total limit:		Yes		
Median removable < 50% SCO II removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		



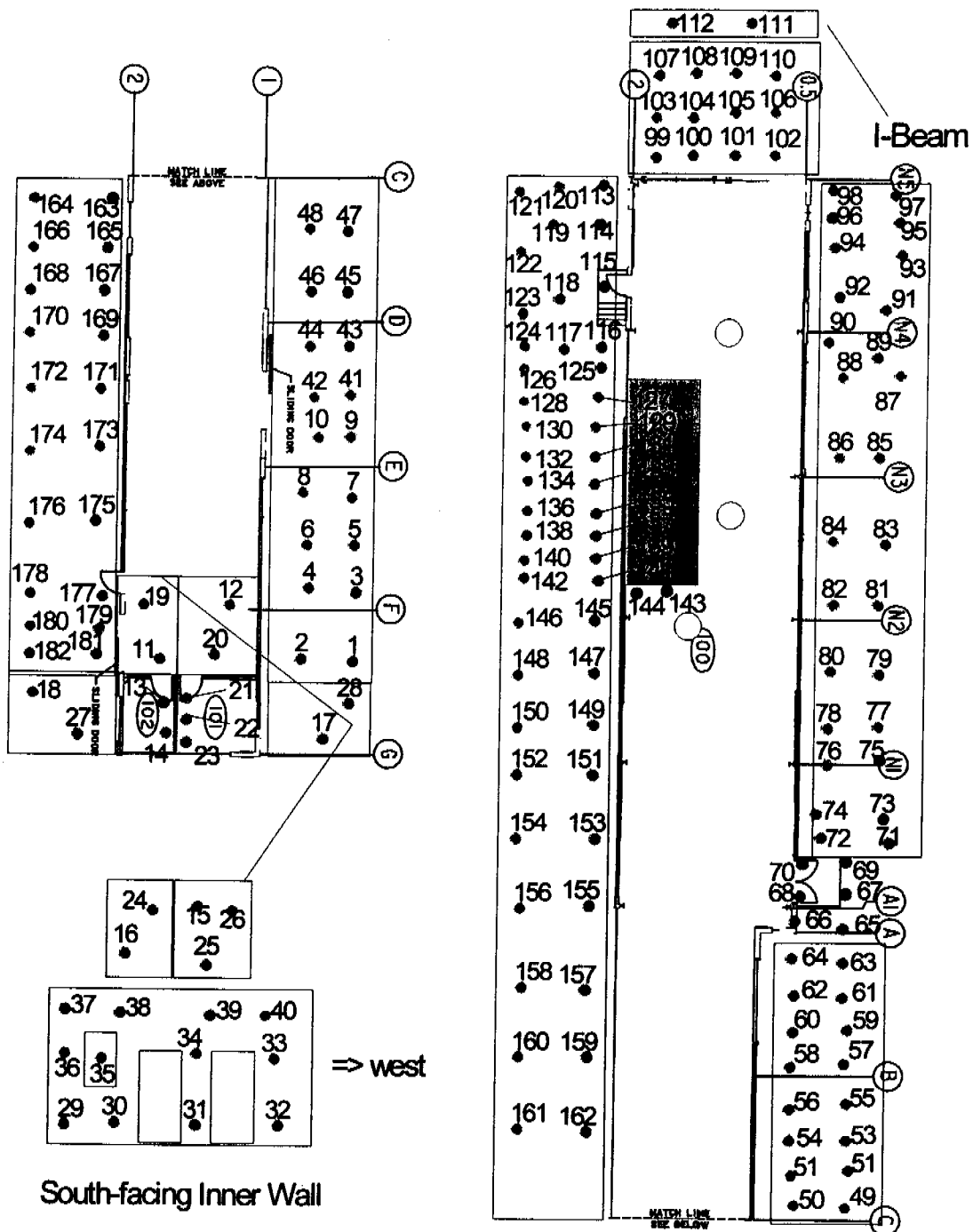
B788 Interior Walls: Removable Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Alpha Samples



- 0 - 20 dpm/100 cm² (Removable Alpha)
- ▲ > 20 dpm/100 cm² (Removable Alpha)



B788 Interior Walls: Removable Beta/Gamma

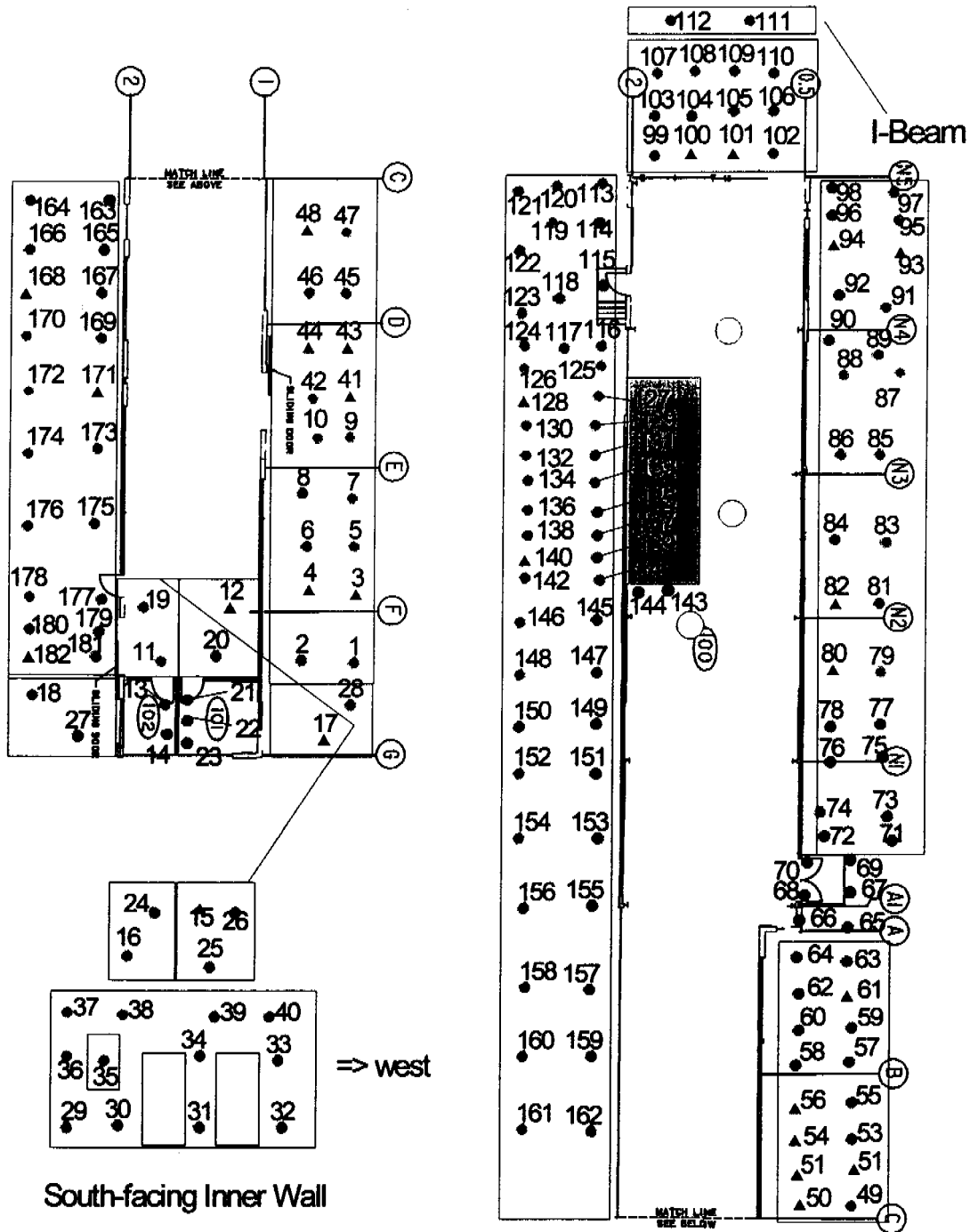
(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Beta/Gamma Samples



• 0 - 1000 dpm/100 cm²

▲ > 1000 dpm/100 cm²



B788 Interior Walls: Total Alpha

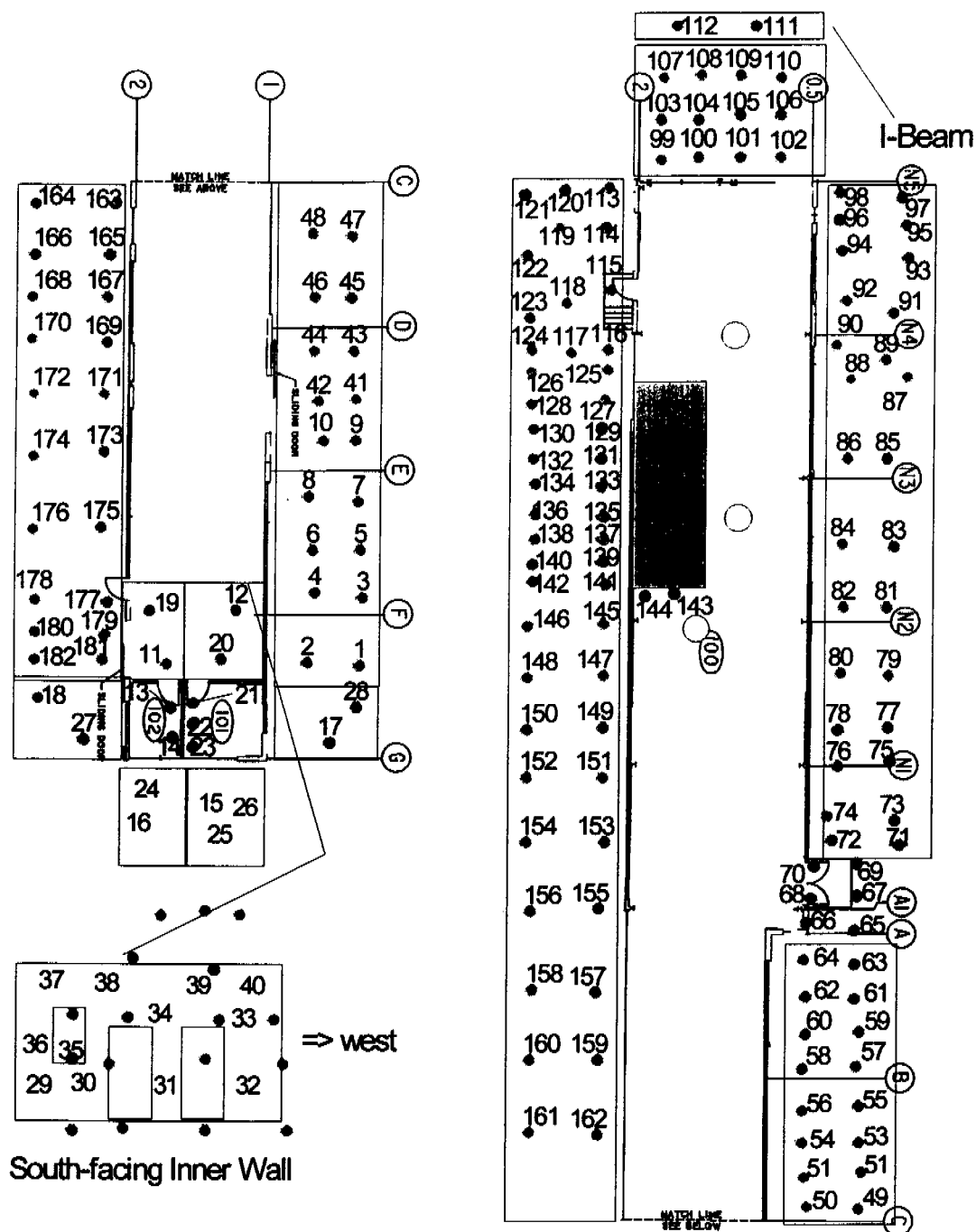
(Note: All dimensions are approximate.)

Approximate Locations of Total Alpha Samples



• 0 - 100 dpm/100 cm²

▲ > 100 dpm/100 cm²



B788 Interior Walls: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Total Beta/Gamma Samples



• 0 - 5000 dpm/100 cm²

▲ > 5000 dpm/100 cm²

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-02-RI

Page 1 of 3

Description of Characterization Survey Unit Isotopic information

WG Pu ☐ Enriched U ☐ Depleted U ☐ Natural U ☐ Other ☒ (see comment section)

Contents of Characterization Survey Unit:

Roof (ceiling) - Interior

Location: Building 788

Survey Plan

Collect measurements from accessible surfaces as specified in the table below:

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.


	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT.	40 (minimum) total α direct measurements at locations selected by an RCT.	_____ samples collected by customer at locations described below, analyzed for gross α .
Beta/Gamma Measurements	40 (minimum) removable β/γ swipes at locations selected by an RCT.	40 (minimum) total β/γ direct measurements at locations selected by an RCT.	_____ samples collected by customer at locations described below, analyzed for gross β .

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicron A-100 or applicable instrumentation.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Michalene Rodriguez

Prepared by: print Radiological Engineer sign date 12-10-98Reviewed by: print John Miller sign date 12-14-98Approved by: print ESSA/BRICKS sign date 12/14/98

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-02-RI

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	10195
Alpha contamination	8.4	9.0	6.6	10.0
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	175.7	176.0	32.6	183.2

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	10195
Alpha contamination	76.7	58.0	77.6	94.7
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1284.4	1321.5	248.4	1342.1

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II Subdivide and resample

Comments:

Prepared by Rad Eng print Michalene Rodriguez sign [Signature] date 1/4/99
 Reviewed by Rad Eng print J. M. Miller sign [Signature] date 1-5-99
 Approved by print ES J. A. Brooks sign [Signature] date 1/6/99

SCO Statistical Analysis

SCO-788-02-RI

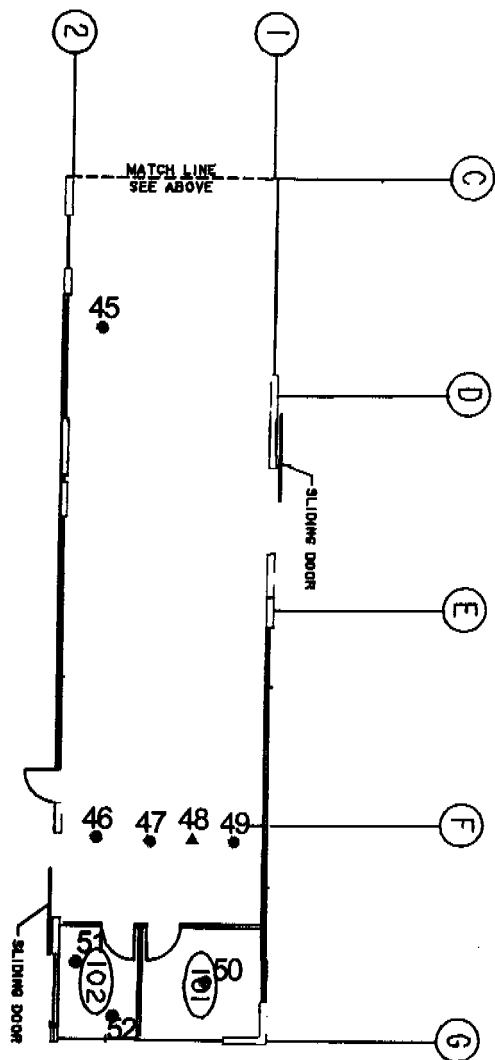
Survey Unit:	SCO-788-02-R1			
Description:	Roof (ceiling) - Interior			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	6	156	1275
2	6	36	140	1347
3	9	12	129	1368
4	3	60	132	1065
5	9	42	204	1473
6	0	36	164	1374
7	6	63	172	1050
8	0	42	124	1272
9	9	56	180	1149
10	9	48	185	1491
11	3	60	136	921
12	3	30	168	1044
13	15	66	148	948
14	18	42	168	1347
15	6	90	188	1257
16	0	12	188	1053
17	3	60	145	780
18	9	222	112	978
19	0	30	156	1011
20	0	30	132	1251
21	0	24	112	1224
22	9	72	152	1155
23	9	138	134	2280
24	9	42	180	843
25	9	120	204	1080
26	12	90	176	1137
27	18	18	168	1449
28	3	18	192	1383

29	9	42	160	1137
30	21	66	164	1308
31	12	384	196	1548
32	15	162	200	1350
33	27	36	220	1446
34	3	90	152	1278
35	6	24	168	1461
36	9	192	184	1392
37	9	18	188	1011
38	0	66	196	1335
39	15	264	232	1344
40	9	12	196	1392
41	21	78	216	1515
42	9	42	172	1359
43	9	258	180	1644
44	18	48	240	1377
45	12	60	176	1296
46	9	252	205	1692
47	6	60	188	1521
48	21	84	216	1359
49	3	78	272	1413
50	15	90	180	948
51	3	18	176	1230
52	0	0	212	1428
Size	52	52	52	52
Max.	27	384	272	2280
Mean	8.42	76.71	175.65	1284.40
Median	9	58	176	1321.5
Std. Deviation	6.59	77.55	32.62	248.37
UCL95	9.95	94.73	183.23	1342.11
RSP 09.05 SCO Tests:				
α Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
Max. removable < SCO II removable limit:		Yes		
Max. total < SCO II total limit:		Yes		
Median removable < 50% SCO II removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
β/γ Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		

SCO Statistical Analysis

SCO-788-02-RI

	Median total < 50% SCO I total limit:	Yes	
	Max. removable < SCO II removable limit:	Yes	
	Max. total < SCO II total limit:	Yes	
	Median removable < 50% SCO II removable limit:	Yes	
	Median total < 50% SCO I total limit:	Yes	



○ = Vent

■ = Contamination Control Room

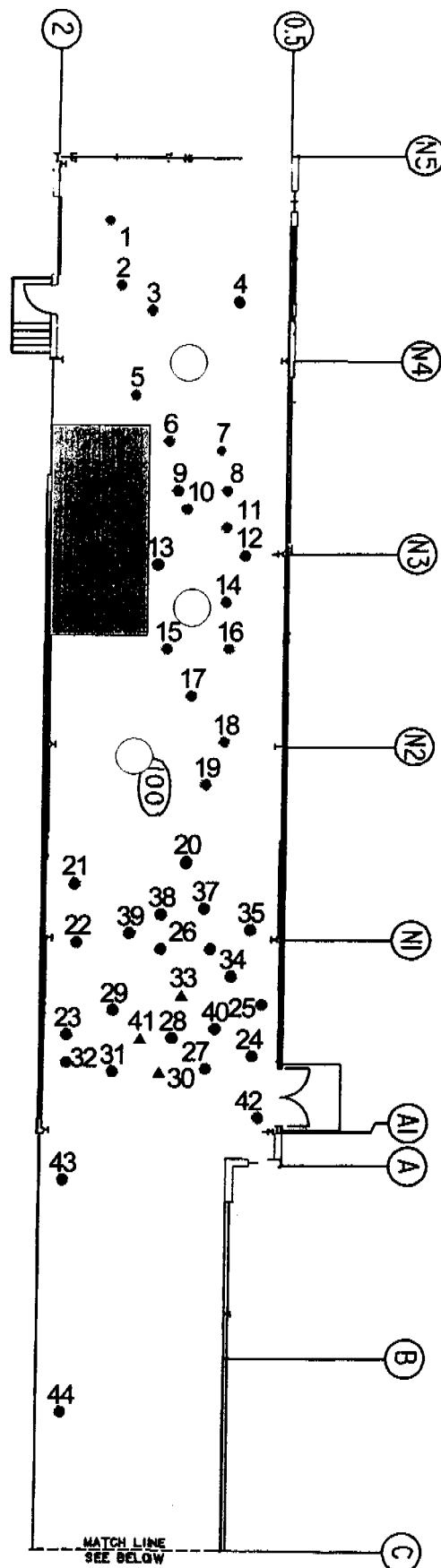
B788 Ceiling Samples: Removable Alpha

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Alpha



- 0 - 20 dpm/100 cm² (Removable Alpha)
- ▲ > 20 dpm/100 cm² (Removable Alpha)



○ = Vent

■ = Contamination Control Room

B788 Ceiling Samples: Total Alpha

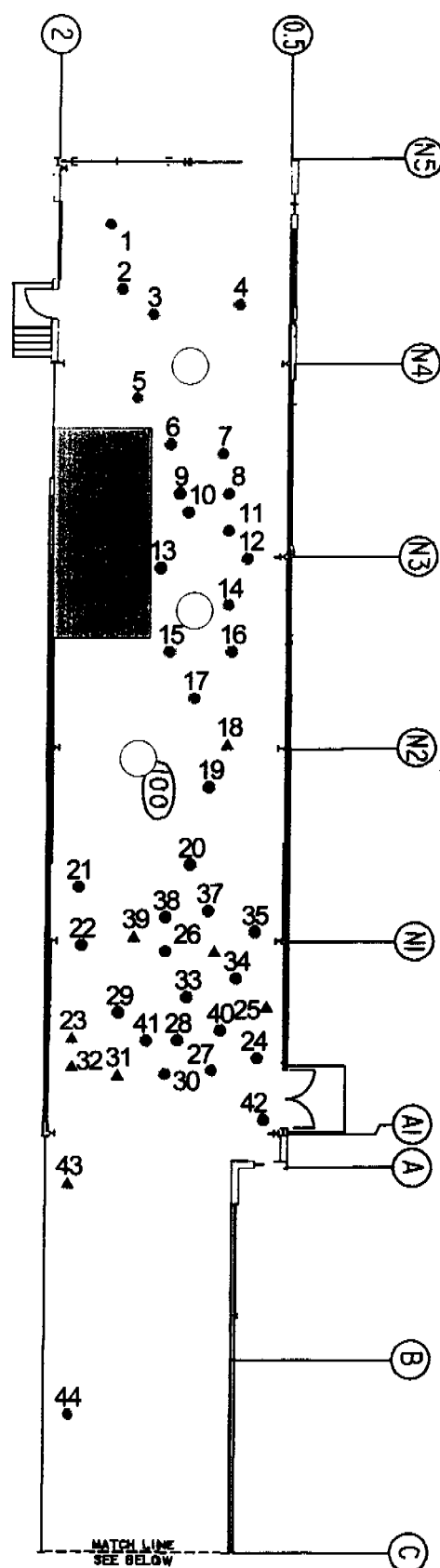
(Note: Drawing not to scale. All dimensions are approximate.)

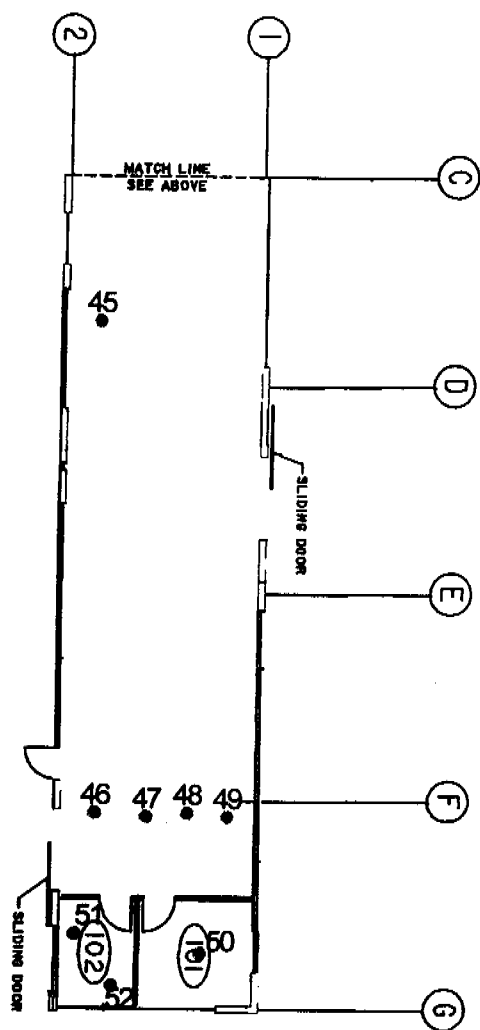
Approximate Locations of Total Alpha Samples



- 0 - 100 dpm/100 cm² (Total Alpha)

▲ > 100 dpm/100 cm² (Total Alpha)





○ = Vent

■ = Contamination Control Room

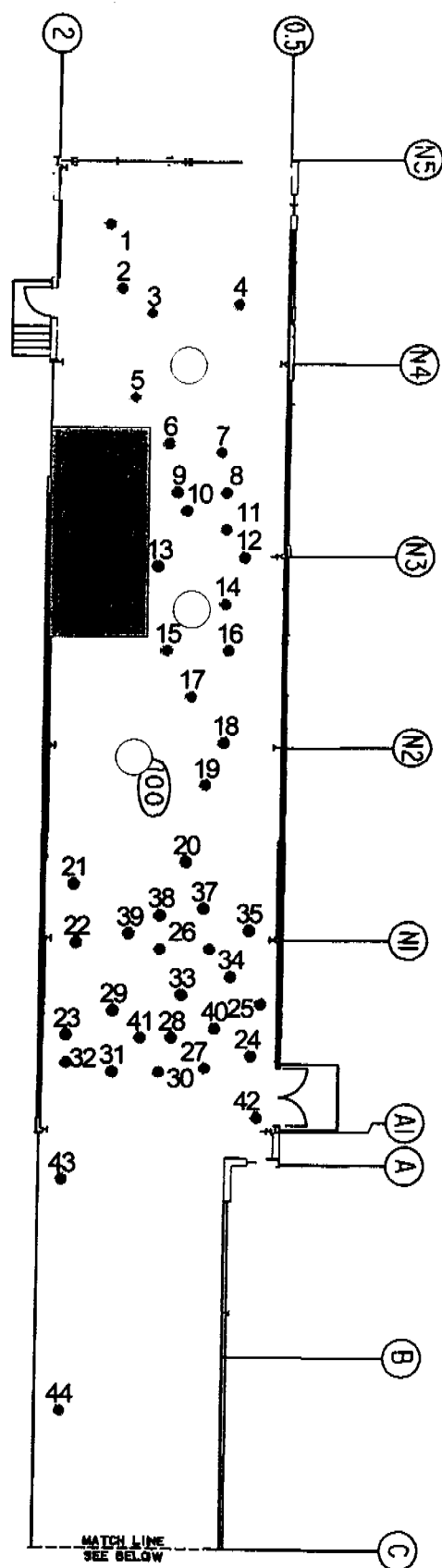
B788 Ceiling Samples: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)



Approximate Locations of Total Beta/Gamma

- 0 - 5000 dpm/100 cm² (Total B/G)
- ▲ > 5000 dpm/100 cm² (Total B/G)



RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-03-CCR

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu ☐ Enriched U ☐ Depleted U ☐ Natural U ☐ Other ☒ (see comment section)

Contents of Characterization Survey Unit:

Contamination Control Room - to include vent exhaust (referenced in past as Permacon)

Location: Inside Building 788

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample. Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

Note: RWP Required For Entry

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicorn A-100 or applicable instrumentation.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Prepared by: print Michalene Rodriguez sign Michalene Rodriguez date 12-10-98
 Reviewed by: print John Miller sign John Miller date 12-14-98
 Approved by: print ESTABROO sign ESTABROO date 12/14/98

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-788-03-CCR

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL 95
Alpha contamination	8.1	3.0	19.1	13.3
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	158.0	156.0	26.0	165.0

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL 95
Alpha contamination	99.7	57.0	110.5	129.1
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1122.6	1092.0	225.3	1182.6

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II _____ Subdivide and resample _____

Comments:

Prepared by Rad Eng print Michalene Rodriguez sign [Signature] date 1/4/99
 Reviewed by Rad Eng print John Miller sign [Signature] date 1-5-99
 Approved by print ESTHER RODRIGUEZ sign [Signature] date 1/6/99

SCO Statistical Analysis

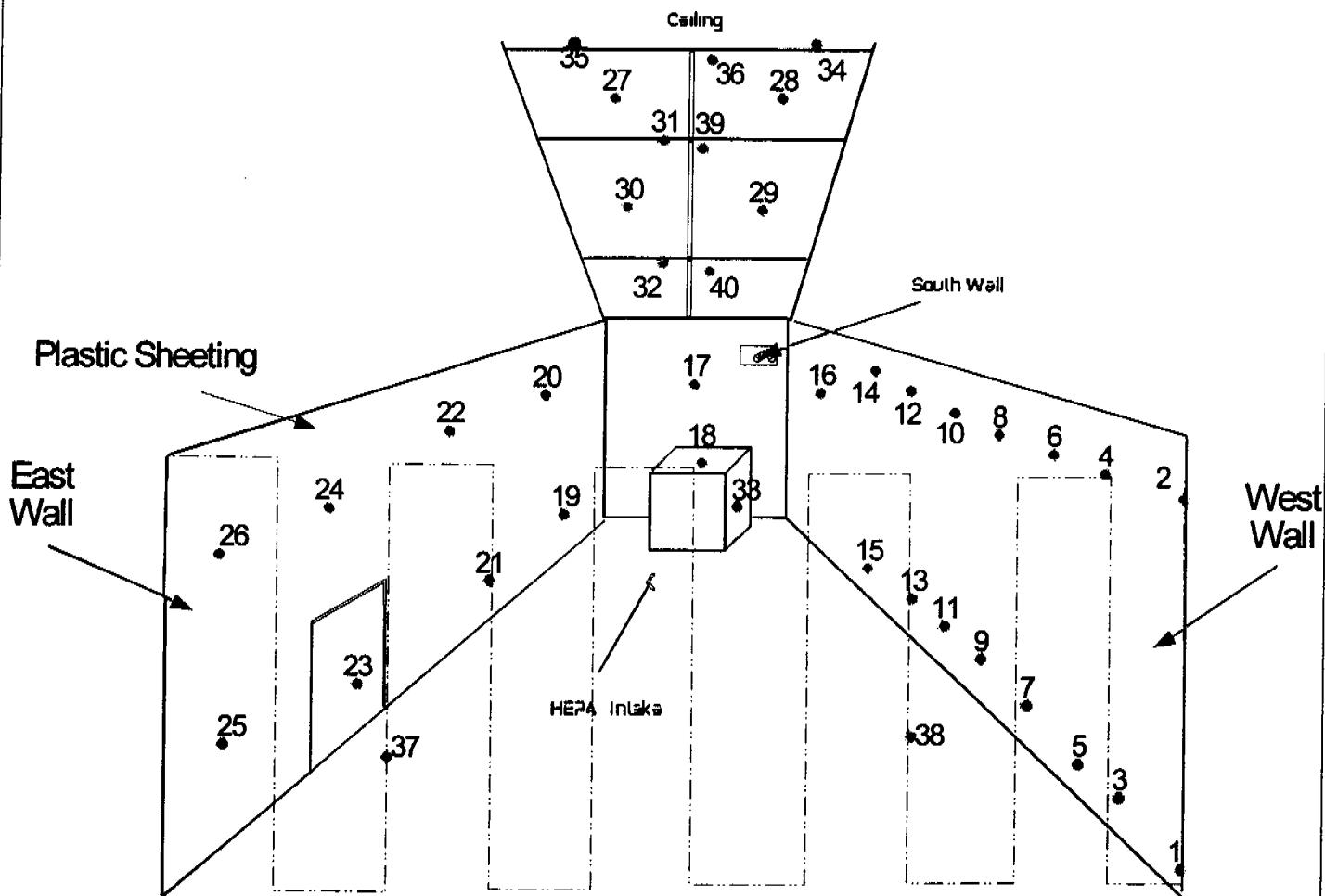
SCO-788-03-CCR

Survey Unit:	SCO-788-03-CCR			
Description:	Contamination Control Room			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	72	172	1110
2	2	96	104	1286
3	2	108	168	1176
4	12	132	192	1218
5	15	216	140	1200
6	12	54	164	1164
7	6	154	178	1089
8	0	120	136	993
9	0	84	128	1095
10	3	48	192	939
11	3	672	156	1134
12	6	54	132	990
13	0	60	204	1062
14	0	54	192	966
15	2	48	176	1089
16	0	48	120	1044
17	15	48	108	1014
18	44	228	136	1332
19	6	42	168	1014
20	9	48	144	1002
21	15	138	144	1041
22	3	54	152	1146
23	0	24	152	1203
24	3	84	184	1059
25	0	54	164	1089
26	3	48	172	1116
27	3	36	152	1503
28	6	48	180	1449

SCO Statistical Analysis

SCO-788-03-CCR

29	12	54	156	1584
30	9	24	124	1383
31	114	120	184	326
32	6	96	184	861
33		228		1740
34	0	96	112	1047
35	3	60	200	1143
36	0	30	172	1026
37	0	264	156	1248
38	0	24	136	1191
39	0	48	152	963
40	3	72	176	888
Size	39	40	39	40
Max.	114	672	204	1740
Mean	8.13	99.70	157.95	1122.58
Median	3	57	156	1092
Std. Deviation	19.12	110.46	26.02	225.28
UCL95	13.29	129.13	164.97	1182.59
RSP 09.05 SCO Tests:				
α Contamination				
	Max. removable < SCO I removable limit:	Yes		
	Max. total < SCO I total limit:	Yes		
	Median removable < 50% SCO I removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
	Max. removable < SCO II removable limit:	Yes		
	Max. total < SCO II total limit:	Yes		
	Median removable < 50% SCO II removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
β/γ Contamination				
	Max. removable < SCO I removable limit:	Yes		
	Max. total < SCO I total limit:	Yes		
	Median removable < 50% SCO I removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		
	Max. removable < SCO II removable limit:	Yes		
	Max. total < SCO II total limit:	Yes		
	Median removable < 50% SCO II removable limit:	Yes		
	Median total < 50% SCO I total limit:	Yes		



Contamination Control Area: Removable Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

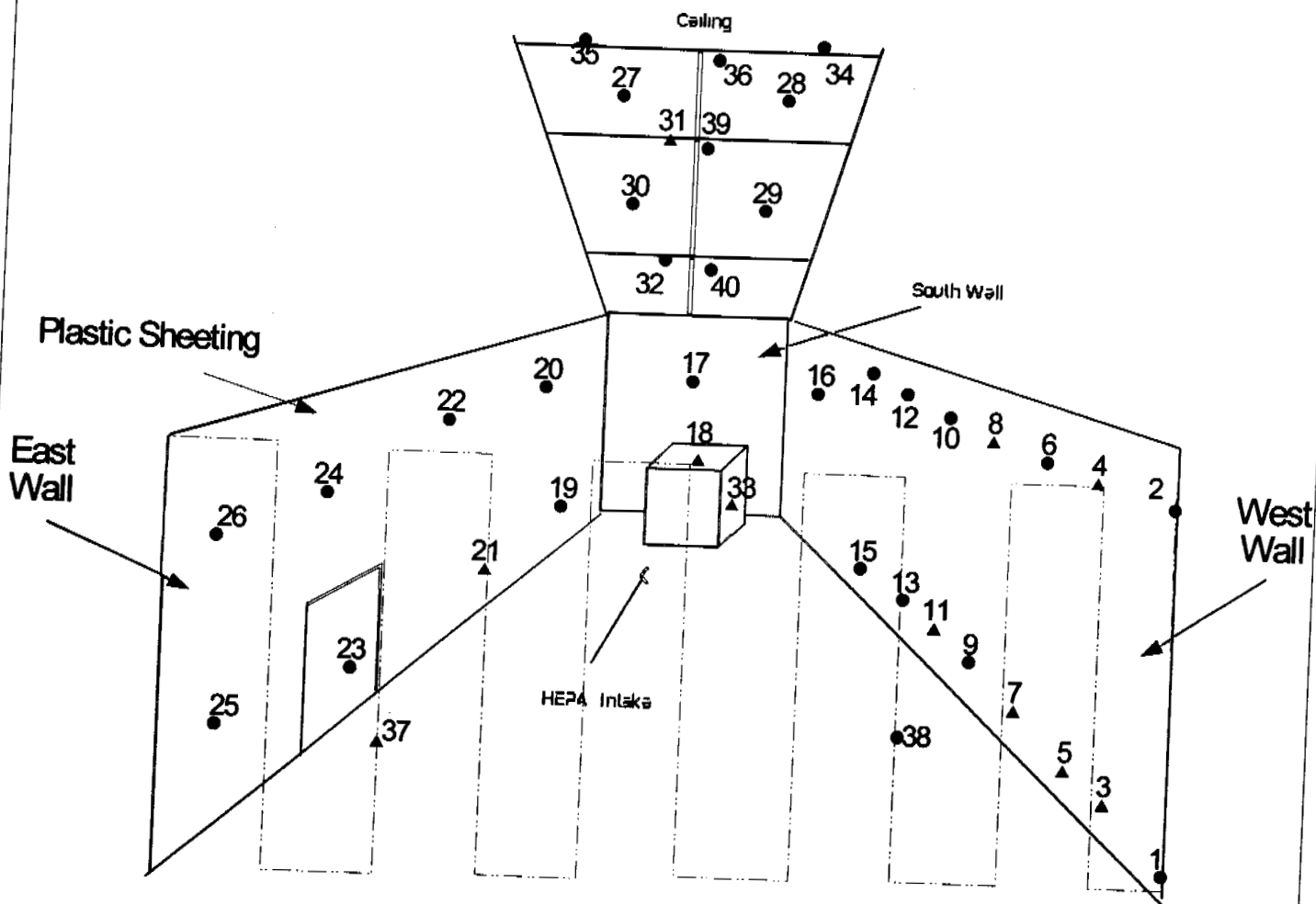
Approximate Location of Removable B/G Samples



• 0 - 1000 dpm/100 cm² (Removable B/G)



▲ > 1000 dpm/100 cm² (Removable B/G)



Contaminated Control Area: Total Alpha

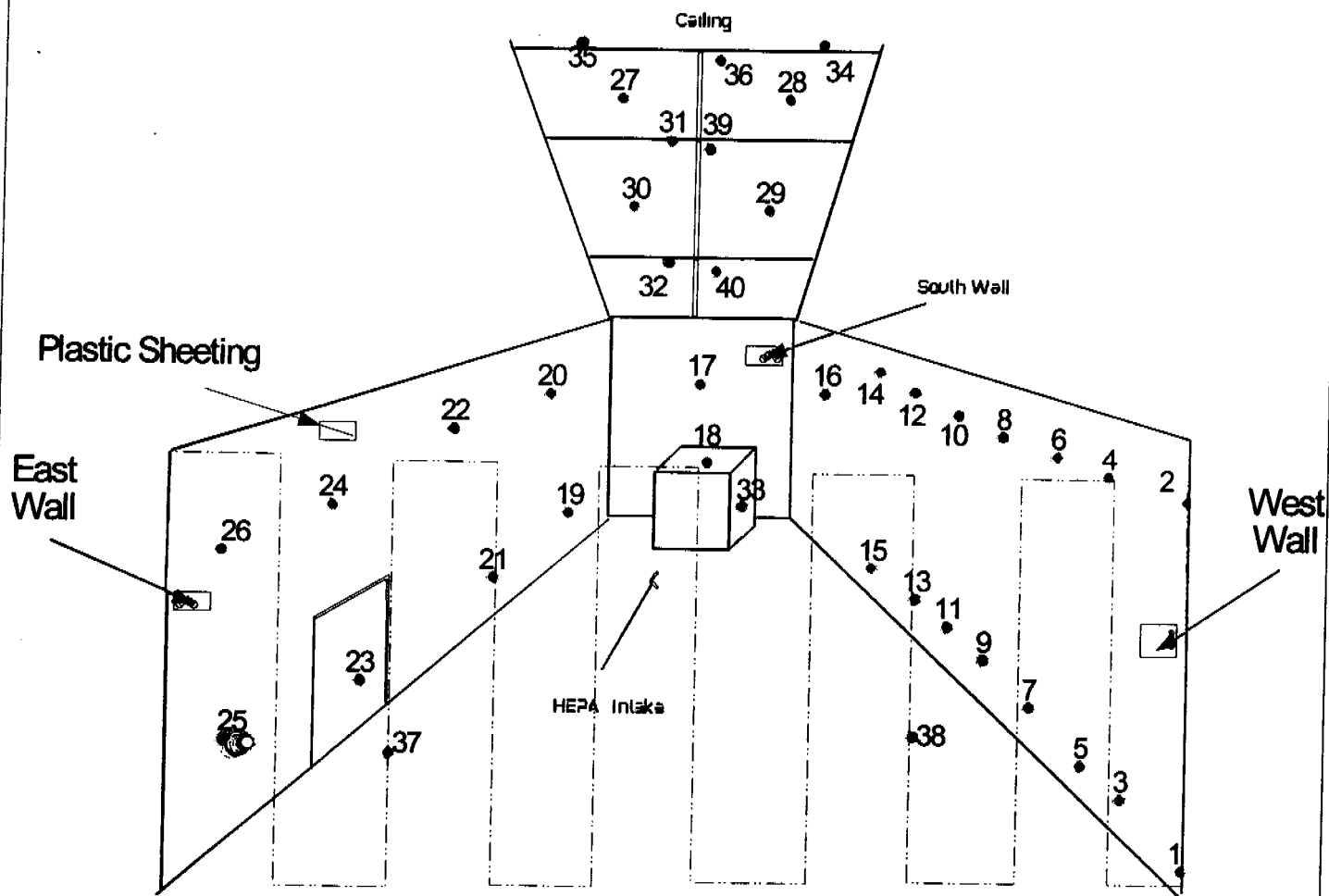
(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Location of Total Alpha Samples



● 0 - 5000 dpm/100 cm² (Total Alpha)

▲ > 5000 dpm/100 cm² (Total Alpha)



Contaminated Control Area: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Location of Total Beta/Gamma Samples



• 0 - 5000 dpm/100 cm² (Total B/G)

▲ > 5000 dpm/100 cm² (Total B/G)

RADIOLOGICAL CHARACTERIZATION FOR SCO (REV 1)

Characterization Survey Unit ID SCO-308A-01-WE

Page 1 of 2

Description of Characterization Survey Unit Isotopic information

WG Pu <input type="checkbox"/>	Enriched U <input type="checkbox"/>	Depleted U <input type="checkbox"/>	Natural U <input type="checkbox"/>	Other <input checked="" type="checkbox"/> (see comment section)
--------------------------------	-------------------------------------	-------------------------------------	------------------------------------	---

Contents of Characterization Survey Unit:

North, South, West, and East Exterior Walls of Building 308A aka Pump House

Location: North side between A & B ponds

Survey Plan

Collect measurements from accessible surfaces as specified in the table below.

Removable and direct surveys are performed by RCTs.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	40 removable β swipes at locations selected by RCT	40 total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Obtain direct alpha and beta/gamma measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bicorn A-100 or appropriate instrumentation.
- Neglect background when calculating alpha and beta/gamma activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Prepared by: print Michalene Rodriguez sign [Signature] date 12-10-98

Reviewed by: print John Miller sign [Signature] date 12-14-98

Approved by: print ESTANISLAO sign [Signature] date 1/14/99

Each section of this form may be enlarged, or continuation pages added, as required.

SCO-CHAR-98-418

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-308A-01-WE

Page 2 of 2

Summary of Data

Removable Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL/95
Alpha contamination	1.4	0.0	2.3	2.0
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	206.1	208.0	17.5	210.8

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	UCL/95
Alpha contamination	698.0	558.0	367.3	795.8
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	1609.2	1545.0	191.8	1660.3

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II Subdivide and resample

Comments:

Prepared by Rad Eng print Michael WE RODRIGUEZsign [Signature] date 12/21/98Reviewed by Rad Eng print John J. Millersign [Signature] date 12/21/98Approved by print ESD 3/2005sign [Signature] date 12/21/98

SCO Statistical Analysis

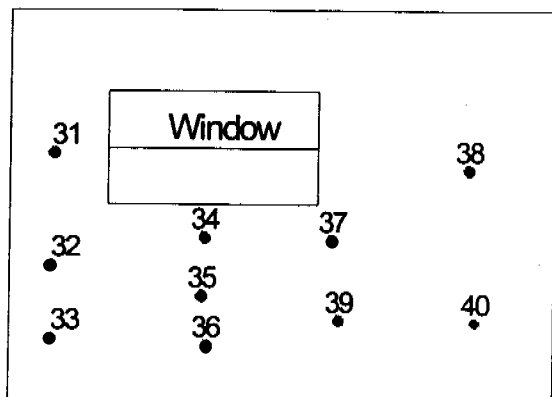
SCO-308A-01-WE

Survey Unit:	SCO-308A-01-WE			
Description:	Exterior Walls of Building 308 Pump House			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
	Max. Removable Activity (α) (dpm/100cm²)	Max. Total Activity (α) (dpm/100cm²)		
SCO I Limit	2.20E+03	1.00E+06		
SCO II Limit	2.20E+05	1.00E+06		
	Max. Removable Activity (β/γ) (dpm/100cm²)	Max. Total Activity (β/γ) (dpm/100cm²)		
SCO I Limit	2.20E+04	2.20E+08		
SCO II Limit	2.20E+06	4.40E+09		
Survey Point	Removable α Activity (dpm/100cm²)	Total α Activity (dpm/100cm²)	Removable β/γ Activity (dpm/100cm²)	Total β/γ Activity (dpm/100cm²)
1	0	450	208	1491
2	0	552	180	1470
3	9	462	220	1383
4	0	504	192	1458
5	0	558	224	1518
6	6	432	168	1530
7	0	390	188	1563
8	3	414	176	1536
9	3	468	196	1516
10	0	516	220	1491
11	0	1476	224	2118
12	0	1518	208	1902
13	0	1008	192	1881
14	0	1428	196	2010
15	3	1038	208	1905
16	6	690	224	1680
17	0	1212	232	1803
18	0	1014	208	1641
19	0	1032	192	1836
20	0	954	220	1416
21	3	516	220	1347
22	0	870	208	1491
23	3	882	192	1533
24	0	1002	232	1530
25	0	594	224	1458
26	0	978	208	1554
27	0	966	192	1683
28	0	912	176	1566

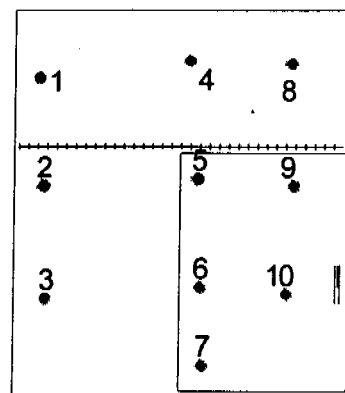
SCO Statistical Analysis

SCO-308A-01-WE

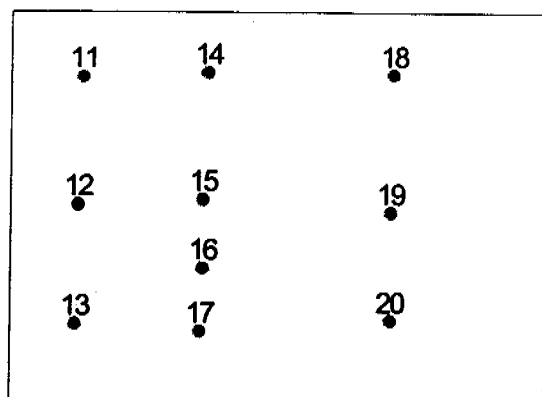
29	0	888	196	1494
30	3	990	220	1734
31	3	558	188	1566
32	0	528	192	1593
33	6	438	224	1701
34	0	222	208	1533
35	0	180	236	1815
36	3	156	220	1356
37	0	204	196	1323
38	3	192	192	1404
39	0	252	224	1650
40	0	474	220	1890
Size	40	40	40	40
Max.	9	1518	236	2118
Mean	1.35	697.95	206.10	1809.23
Median	0	558	208	1545
Std. Deviation	2.25	367.34	17.49	191.84
UCL95	1.95	795.81	210.76	1660.33
RSP 09.05 SCO Tests:				
α Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
Max. removable < SCO II removable limit:		Yes		
Max. total < SCO II total limit:		Yes		
Median removable < 50% SCO II removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
β/γ Contamination				
Max. removable < SCO I removable limit:		Yes		
Max. total < SCO I total limit:		Yes		
Median removable < 50% SCO I removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		
Max. removable < SCO II removable limit:		Yes		
Max. total < SCO II total limit:		Yes		
Median removable < 50% SCO II removable limit:		Yes		
Median total < 50% SCO I total limit:		Yes		



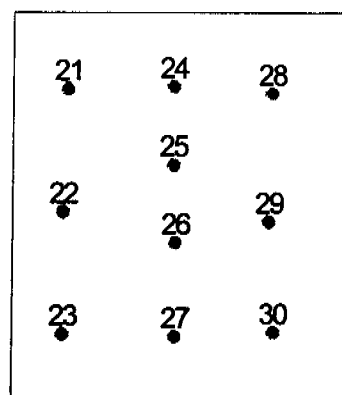
East Side



North Side



West Side



South Side

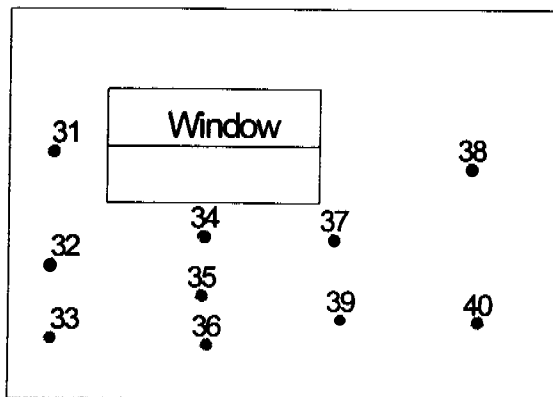
Pump House

Pump House: Removable Alpha

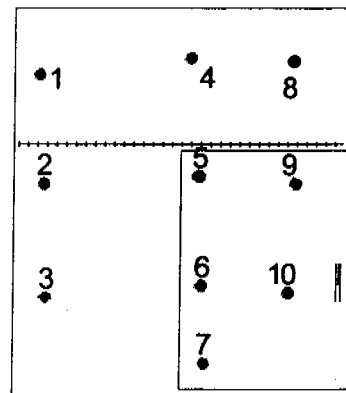
(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Alpha Samples

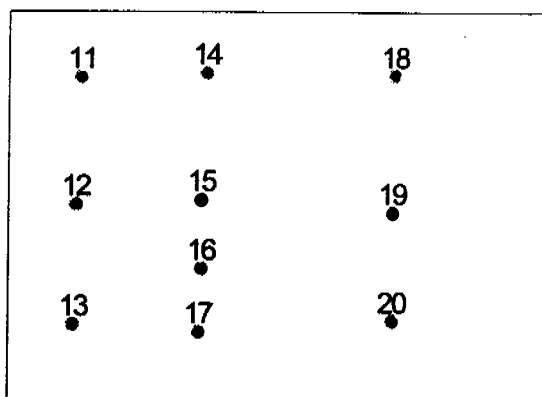
- 0 - 20 dpm/100 cm² (Removable Alpha)
- ▲ > 20 dpm/100 cm² (Removable Alpha)



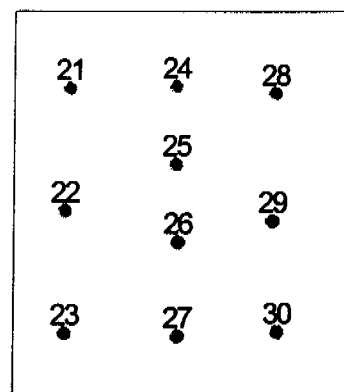
East Side



North Side



West Side



South Side

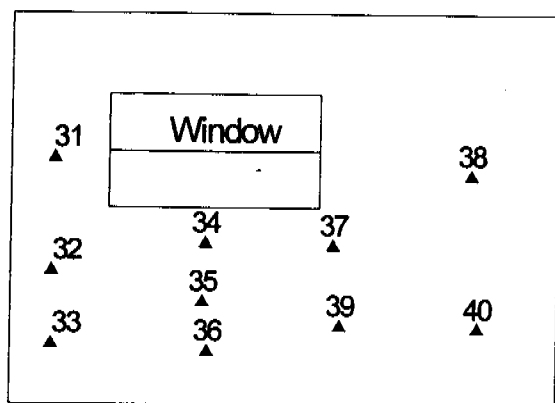
Pump House

Pump House: Removable Beta/Gamma

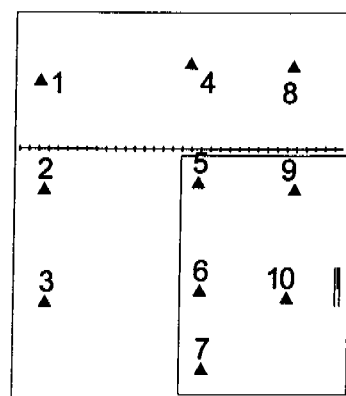
(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Removable Beta/Gamma Samples

- 0 - 1000 dpm/100 cm² (Removable B/G)
- ▲ > 1000 dpm/100 cm² (Removable B/G)



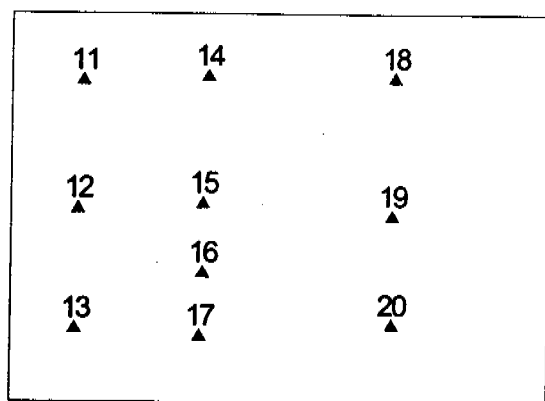
East Side



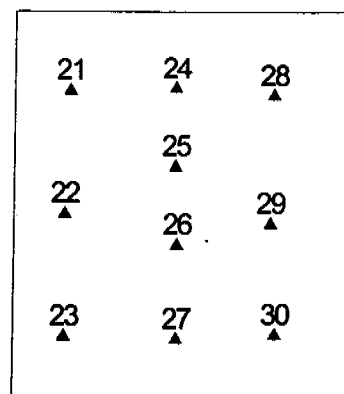
North Side

Sliding Door

Pump House



West Side



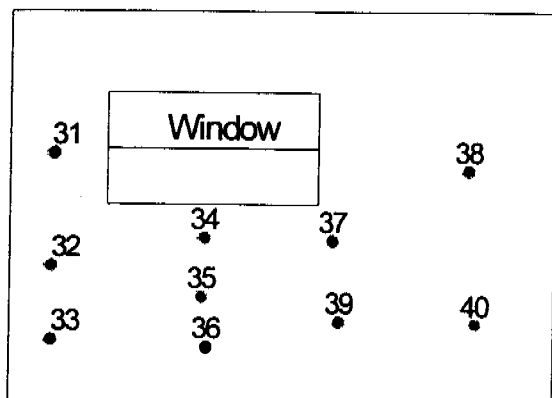
South Side

Pump House: Total Alpha

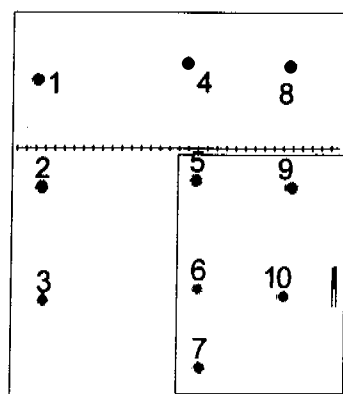
(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Total Alpha Samples

- 0 - 100 dpm/100 cm² (Total Alpha)
- ▲ > 100 dpm/100 cm² (Total Alpha)

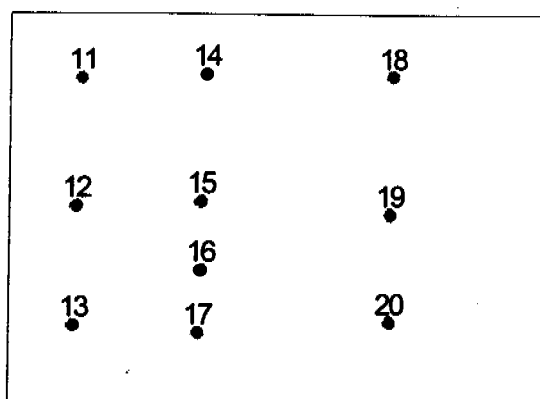


East Side

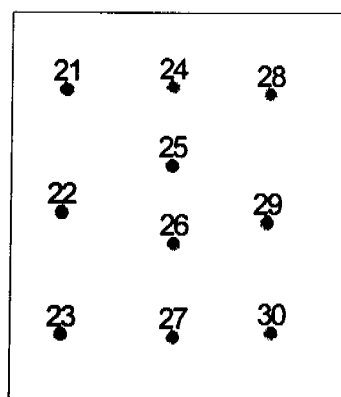


North Side

Pump House



West Side



South Side

Pump House: Total Beta/Gamma

(Note: Drawing not to scale. All dimensions are approximate.)

Approximate Locations of Total Beta/Gamma Samples

- 0 - 5000 dpm/100 cm² (Total B/G)
- ▲ > 5000 dpm/100 cm² (Total B/G)

RADIOLOGICAL CHARACTERIZATION FOR SCOCharacterization Survey Unit ID SCO-EQU-01-PMCM

Page 1 of 2

Description of Characterization Survey Unit Isotopic informationWG Pu ☐ Enriched U ☐ Depleted U ☐ Natural U ☐ Other ☒ (see comment section)**Contents of Characterization Survey Unit:**

Pug Mill and Cement Mixer

Location: Pug Mill – South of the Clarifier Tank,

Cement Mixer - between Building 788 (west) and Solar Pond 207C

Survey Plan

See attached Technical Basis Document 00119.

Sampling is the responsibility of the customer.

If sampling is specified, the removable survey does not need to be in the same location as the sample.

Return the results of all measurements to Radiological Engineering, T891C, for evaluation.

	Swipes for Removable Contamination	Direct Measurements Made with a Survey Meter	Samples Collected from Surfaces and Analyzed by a Lab
Alpha Measurements	40 (minimum) removable α swipes at locations selected by an RCT	40 (minimum) total α direct measurements at locations selected by an RCT	_____ samples collected by customer at locations described below, analyzed for gross α
Beta/Gamma Measurements	30 removable β swipes at locations selected by RCT	_____ total β direct measurements at locations selected by RCT	_____ samples collected by customer at locations described below, analyzed for gross β

Note. The sum of direct measurements and samples should be ≥ 30 . A typical survey plan calls for 30 direct measurements and zero samples. If high levels of contamination are expected below non-factory original coatings, the number of samples would increase.

Survey Plan Comments and Special Instructions

- Radionuclides of concern are Americium-241 and Plutonium-239. Isotopic mixture is approximately 76% Am-241 and 23% Pu-239/240.
- Radiological Work Permit required before entry.
- Obtain direct alpha measurements by performing 1 minute PAT using the NE Electra with DP6 Probe or Bieron A-100.
- Neglect background when calculating alpha activity.
- RCT shall annotate each survey conducted on each page (front and continuation sheets) with a unique Survey Number acquired by the RCT from a Survey Log located in B788.
- Record actual instrument readings for direct counts, and smears.
- Document results on "788 Cluster Radiological Contamination Survey Form." This form is equivalent to RSFORMS-07.02-01.
- Attach copy of completed survey(s) to this Characterization Form, RSFORM-09.05-01, and forward to Radiological Engineering, T891-C.

Michalene Rodriguez

Prepared by: print Radiological Engineer sign [Signature] date 1/6/99Reviewed by: print John Miller sign [Signature] date 1-6-99Approved by: print ESTABROOKS sign [Signature] date 1/6/99

Each section of this form may be enlarged, or continuation pages added, as required. Logbook Control Number SCO-98-418

RADIOLOGICAL CHARACTERIZATION FOR SCO

Characterization Survey Unit ID SCO-EQU-01-PMCM

Page 2 of 2

Summary of Data

Removable Contamination Dpm/100 cm ²	Mean	Median	Standard Deviation	LOGS
Alpha contamination	See Note ¹	N/A	N/A	N/A
Plutonium				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma	See Note ¹	N/A	N/A	N/A

Total Contamination dpm/100 cm ²	Mean	Median	Standard Deviation	LOGS
Alpha contamination	212,500 ²	N/A	N/A	N/A
Plutonium contamination				
Enriched uranium				
Natural or depleted uranium				
Beta/gamma contamination	27,800 ²	N/A	N/A	N/A

Attach copies of survey forms and sampling data.

Analysis of Results

SCO I XX SCO II _____ Subdivide and resample _____

Comments:

¹ Areas are inaccessible.

² Total (fixed and removable) measurements were not obtained due to inaccessible areas and hazards associated with entry into the Pug Mill and Cement Mixer i.e., confined space entry. An estimate of the total contamination present will be based on Technical Basis Document-00119 (See Attachment).

Prepared by Rad Eng print Michalene Rodriguez sign [Signature] date 1/6/99
 Reviewed by Rad Eng print John Miller sign [Signature] date 1-6-99
 Approved by print ESTHER ROXAS sign [Signature] date 1/6/99

Logbook Control Number SCO-CHAR-98-418

**The Estimation of Total Surface Contamination Levels Utilizing
Analytical Data Obtained From Analysis of Clarifier Sludge Material.**

January 5, 1999
Technical Basis Document-00119

 1/6/99

Written By: Michalene Rodriguez Signature Date
Radiological Engineer

 1/6/99

Reviewed By: John J. Miller Signature Date
Radiological Engineer

 1/6/99

Approved By: H. Bates Estabrooks Signature Date
Radiological Engineering Manager

Purpose

The purpose of this document is to provide a technical basis for the methodology in applying analytical data obtained from the clarifier sludge material as an estimation of total surface contamination. This method will be applicable to various items with unsurveyable or inaccessible areas located in the vicinity of Building 788 and the Solar Evaporation Ponds (SEP).

Background

The Solar Evaporation Ponds, also known as the "high nitrate ponds," were used primarily for the disposal of low-level radioactive wastes contaminated with high concentrations of nitrate and for difficult to treat wastes. Solar pond clean-up activities began in the mid-1980's and was a response action to the presence of waste materials in the solar ponds and the presence of contamination in nearby soils, groundwater, and surface water. In 1985, Building 788, Trailer 788A, the 207A Clarifier Tank, and various ancillary equipment (Pug Mill, cement mixer) were constructed as part of the treatment process to convert pond sludge into pondcrete, which is a mixture of SEP sludge and Portland cement.

In 1989, the last of the process waste sludge was removed from Pond 207A and pumped into the open top clarifier tank. Clarifier operations were halted shortly thereafter leaving approximately 16,500 gallons of waste sludge and water in the 30,000 gallon capacity clarifier tank.

In 1992 and 1995 two laboratory analyses were conducted to determine and estimate the radionuclides and associated activities in the waste sludge. The first study in 1992, was from Brown and Root, Inc. The analysis revealed approximately 3400-6600 pCi/g gross alpha and 540-860 pCi/g gross beta activity in the sludge waste (Attachment I). The second study performed in 1995, from Halliburton NUS Corporation, estimated the sludge contained 13,000 pCi/g of Americium-241, 3,900 pCi/g of Plutonium-239/240 and 89 pCi/g of Plutonium-238 (Attachment II).

A letter dated January 7, 1998 to S.M. Nesta from C.A. Patnoe, K-H Air Quality Management, states the "Brown and Root analysis is the most accurate and representative analysis of the sludge and water contained in the tank." (Attachment III).

In 1998, the remaining sludge held in the Clarifier Tank was successfully removed. The mission today is the Decontamination and Decommissioning (D&D) of the Building 788 Cluster by June 30, 1999. This action will satisfy one of the requirements of Order on Consent 97-08-21-01 that has been agreed to by Kaiser-Hill. The general cleanup, removal and packaging of waste and equipment from the SEPs will supplement this action.

Technical Discussion

The waste generated from the D&D of the Building 788 Cluster will be disposed of as low-level waste, low-level mixed waste, or free released. The majority of the waste will be sent as low-level waste to a recycle metal melt facility and will be shipped, per Department of Transportation, as Surface Contaminated Objects (SCO). The low-level mixed waste will be sent to Envirocare or NTS and will be shipped as Low Specific Activity Waste. Few items from the D&D process will be free released. Items such as desks, chairs, lockers, and cabinets, located inside Building 788 and T788A will be free released upon survey results.

To demonstrate compliance with Radiological Safety Practice PRO-267-RSP-09.05, *Radiological Characterization For Surface Contaminated Objects*, DOT shipping regulations, and disposal site waste acceptance criteria, characterization surveys were conducted. The surveys were performed on the interior and exterior walls, roof top, and ceiling of Building 788, Contamination Control Room (located inside Building 788), interior surface of the clarifier tank (removable only), catwalk, and exterior walls of the 308A Pump House.

Certain items and materials such as the Pug Mill, Cement Mixer, Clarifier Tank (total) and wooden surfaces were not surveyed due to the items being inaccessible, posing a hazard, or composed of unsurveyable material. The intention to characterize these items is to apply the analytical data, taken from the sludge waste, from Brown and Root, Inc., as an estimate of total surface contamination for these items. The methodology imposed is shown below:

Alpha Parameters:

Description	Amount
Activity	6600 pCi/g
Density of Sludge (from Halliburton NUS Report)	1.45 g/cm ³
Thickness of Residual Sludge Remaining on Surfaces (assumed)	0.1 cm
Conversion Factor	1 Ci = 2.22E10 ¹² dpm

$$\text{Activity (dpm/100 cm}^2\text{)} = [6600 \text{ pCi/g}] [1.45 \text{ g/cm}^3] [0.1 \text{ cm}] =$$

$$[9.57\text{E}10^{-10} \text{ Ci/cm}^2] [2.22\text{E}10^{12} \text{ dpm}] [100 \text{ cm}^2] \sim 212,500 \text{ dpm/100 cm}^2$$

Beta Parameters:

Description	Amount
Activity	860 pCi/g
Density of Sludge (from Halliburton NUS Report)	1.45 g/cm ³
Thickness of Residual Sludge Remaining on Surfaces (assumed)	0.1 cm
Conversion Factor	1 Ci = 2.22E10 ¹² dpm

$$\text{Activity (dpm/100 cm}^2\text{)} = [860 \text{ pCi/g}] [1.45 \text{ g/cm}^3] [0.1 \text{ cm}] =$$

$$[1.25\text{E}10^{-10} \text{ Ci/cm}^2] [2.22\text{E}10^{12} \text{ dpm}] [100 \text{ cm}^2] \sim 27,800 \text{ dpm/100 cm}^2$$

Conclusions

The upper SCO I limit as specified in Table I of RSP-09.05 is 1,000,000 dpm/cm² for fixed Plutonium/Americium on inaccessible areas. Based on this information, items coming from the SEP area with inaccessible areas, i.e., Pug Mill, cement mixer, meet the definition of SCO I and will be assigned the above calculated activities.


References

PRO-267-RSP-09.05, Rev. 1, *Radiological Characterization for Surface Contaminated Objects*, November, 98.

Historical Release Report For The Rocky Flats Plant, Volume I, June, 1992.

Safety Analysis For Clarifier To RCRA Stable Project, Nuclear Safety Technical Report, Revision 0, NSTR-017-97, Rocky Mountain Remediation Services, LLC, December, 1997.

Integrated Safety Management Plan For The Clarifier To RCRA Closure Project, Revision 0, RF/RMRS-98-213UN, Rocky Mountain Remediation Services, LLC, May, 1998.

Brown & Root, Inc. 	CONTRACT NO. JR-1198
STANDARD PROCESS DATA SHEETS	IDENTIFICATION NO. 000-020-00-001
APPROVAL DATE 06/04/92	PAGE 46 OF 97

ANALYSIS	UNITS	RANGE	MEAN ^(a) CONCENTRATION
Cyanide-Amenable	mg/kg	NA	NA
Cyanide-Total	mg/kg	21-190	87
Gross Alpha	pCi/g	3400-6600	5250
Gross Beta	pCi/g	540-860	695
Moisture-Gravimetric	%	33.1-72.5	60.6 ^(a)
Moisture-Karl Fisher	%	NA	NA
pH	units	9.7-9.8	9.75
Specific Gravity	-	NA	NA
Swell Test	%	10	10
TOC (Total Organic Carbon)	mg/kg	3500-6400	5175
Chloride ^(a)	mg/l	160-180	168
Nitrate ^(a)	mg/l	410-450	430
% Recovery of Solids ^(a)	%	18.0-22.2	21
Phosphorus, Total (as P) ^(a)	mg/l	33-52	46
Sulfate ^(a)	mg/l	210-280	243
TDS (Total Dissolved Solids) ^(a)	mg/l	4600-5400	4950
Total Solids	%	27.5-66.9	39.4

Inorganics

Arsenic	mg/kg	13.5-21.9	12
Barium	mg/kg	94.8-217	183
Boron	mg/kg	420-1380	930
Cadmium	mg/kg	2010-4660	3660
Chromium	mg/kg	1180-3190	2480
Lead	mg/kg	83-191	161
Magnesium	mg/kg	10,400-24,200	20,500
Mercury	mg/kg	5-14	9
Nickel	mg/kg	339-902	700
Potassium	mg/kg	28,700-67,900	56,500
Selenium	mg/kg	ND	ND
Silver	mg/kg	64.6-166	134.9
Sodium	mg/kg	39,200-96,300	78,900

SLUDGE


Halliburton NUS
CORPORATION
NUS LABORATORY
 5350 Campbells Run Road
 Pittsburgh, Pennsylvania 15205

TEL: (412) 747-2500

FAX: (412) 747-2559

May 05, 1995

Report No.: 00025501

Section A Page 1

LABORATORY ANALYSIS REPORT

CLIENT NAME: ROCKY FLATS - C/O NUS CORPORATION
 ADDRESS: 661 ANDERSEN DRIVE
 PITTSBURGH, PA 15220-
 ATTENTION: MR. RICH NINESTEEL

SAMPLE ID: CLARIFIER AS REC'D
 NUS SAMPLE NO: P0297299
 P.O. NO.:

NUS CLIENT NO: 1431 0007
 WORK ORDER NO: 3A23
 VENDOR NO:

DATE SAMPLED: UnAvail
 DATE RECEIVED: 03-JAN-95
 APPROVED BY: Lynch, Pat

LN	TEST		RESULT	UNIT
	CODE	DETERMINATION		
1	R110AS	Isotopic Americium and Curium Americium-241 [Am-241]	13 +/- 2	nCi/g
2	R200S	Gamma Spectroscopy Cesium-134	< 4	pCi/g
		Cesium-137	< 6	pCi/g
3	R110PS	Isotopic Plutonium Plutonium-238 [Pu-238]	89 +/- 37	pCi/g
		Plutonium-239/240 [Pu-239/240]	3900 +/- 400	pCi/g
4	ROSS	Radium-226 [Ra-226]	6.2 +/- 0.7	pCi/g
5	R110US	Isotopic Uranium Uranium-233/234 [U-233/234]	28 +/- 3	pCi/g
		Uranium-235 [U-235]	1.1 +/- 0.2	pCi/g
		Uranium-238 [U-238]	32 +/- 4	pCi/g
6	R11S	Strontium-89 and -90 Strontium-89 [Sr-89]	0.53 +/- 0.06	pCi/g
		Strontium-90 [Sr-90]	0.88 +/- 0.27	pCi/g
7	ABES	Beryllium, Total (Be)	320	mg/kg
8	ACDS	Cadmium, Total (Cd)	2100	mg/kg
9	S088	Bulk Density on Waste	1.45	g/cc
10	1630	Percent Moisture	61.9	%
11	1490S	Non-aqueous sample pH in Water	9.8	
19	DPACK	CLP Data Package Deliverable	DONE	

COMMENTS:

- 2 Density of original sample 1/10 of the density of standard.
 Density adjusted to 98% of standard. (All Nuclides affected.)



KAISER • HILL
COMPANY

INTEROFFICE MEMORANDUM

DATE: January 7, 1998

TO: S. M. Nesta, National Environmental Policy Act, Bldg. T130C, X6386

FROM: *C. A. Patnoe*
C. A. Patnoe, K-H Air Quality Management, Bldg. T130C, X2440

SUBJECT: AIR QUALITY REVIEW OF THE PROJECT TO EMPTY THE SOLAR PONDS CLARIFIER TANK - CAP-003-98

Ref: Letter #SMN-236-97 to distribution entitled "Review of the Project to Empty the Solar Ponds Clarifier Tank", dated December 17, 1997, the attached NEPA checklist, the preliminary project plan dated October 30, 1997, and Brown and Root laboratory data sheets, identification number 000-020-00-01 dated 06/04/92

Per your request, Air Quality Management/Radian International has evaluated the project to remove solar pond sludge from the Building 788 clarifier tank for air quality regulatory issues. The project has a potential to emit regulated air pollutants and was assessed to determine reporting, air permitting, regulatory approval, testing, recordkeeping, and monitoring requirements. This assessment is based on the following worst-case, bounding assumptions derived from information provided by project personnel:

- The tank is an open-top tank, has a capacity of 30,000 gallons, and currently contains approximately 16,500 gallons of sludge and water.
- The Brown and Root, Inc. laboratory analysis from 1992 is the most accurate and representative analysis of the sludge and water contained in the tank.
- For the purposes of this air assessment, radionuclide contamination is assumed to be 6,600 picocuries per gram (pCi/g) gross alpha (assumed to be americium 241), and 860 pCi/g gross beta (assumed to be plutonium 241) for the entire contents of the tank.
- The highest concentration volatile organic contaminant (VOC) level is tetrachloroethylene (BIN A hazardous air pollutant) at 1,000 micrograms per kilogram. The highest concentration regulated inorganic contaminants are cadmium at 4,660 milligrams per kilogram (mg/kg), and chromium at 3,190 mg/kg (BIN A hazardous air pollutants).
- The average specific gravity for the tank contents is 1.28 (36% total dissolved solids).
- The project will utilize sparging and high pressure water sprayers to help mobilize the sludge during draining operations.
- Conservative estimates for cadmium and chromium emissions were calculated utilizing particulate emission factors for cooling towers.
- All fuel-fired compressors and generators utilized during the project will be existing on-Site units.

APPENDIX B

ANALYTICAL & RADIOCHEMISTRY (LAB) RESULTS

Rad Screen Summary Sheet

Lab Analysis Data Sheets

Thermo NuTech - Rocky Flats Radscreen Results

RN: 99A3190
Analysis: Radscreen
Report Date: 10/27/98

Distribution/Fax: APO/4556
D. Spruce/7228



Laboratory Sample ID	APO Sample ID		Matrix	Gross Alpha		Gross Beta		Total Activity pCi/g	DOT Class
	RUN	Event		pCi/g	2σ	pCi/g	2σ		
98100250-01	99A3190	001	Solid	0.6	0.4	1.0	0.6	2.60	NONRAD
98100250-02	99A3190	002	Solid	1.0	0.5	0.6	0.6	2.90	NONRAD
98100250-03	99A3190	003	Solid	1.8	0.5	1.4	0.6	4.30	NONRAD
98100250-04	99A3190	004	Solid	1.2	0.5	1.3	0.6	3.60	NONRAD
98100250-05	99A3190	005	Solid	0.3	0.4	1.0	0.6	2.30	NONRAD
98100250-06	99A3190	006	Solid	1.0	0.5	0.9	0.6	3.00	NONRAD
98100250-07	99A3190	007	Solid	4	3	6	3	16.00	NONRAD
98100250-08	99A3190	008	Solid	4	3	6	3	15.00	NONRAD
98100250-09	99A3190	009	Solid	0.7	0.4	1.1	0.6	2.80	NONRAD
98100250-10	99A3190	010	Solid	0.5	0.4	1.7	0.6	3.20	NONRAD
98100250-11	99A3190	011	Solid	0.3	0.3	0.6	0.5	1.70	NONRAD

DOT Classification <2000 pCi/g total activity is NONRAD
>= 2000 pCi/g total activity is RAD

Total Activity Calculated as the sum of the gross alpha and beta activities AND the measurement uncertainties for these two measurements.
If the measured activity is negative, 0 pCi/g (instead of the negative value) is used to calculate the total activity.

Analysis Methods Sample Preparation Procedures: L-6194-I, "Preparation of Oils and Solvents for Analysis of Gross Alpha and Beta Activity" and
L-6276-A, "Sample Preparation for Radiological Screening by Gas Proportional Counting."
Counting Procedure: L-6285-A, "Operation of Tennessee LB4100 Gas Proportional Counters."

Handwritten signature: T. Black
Technical Review Date: 10-27-98
Handwritten signature: Donald L. Taylor
Quality Assurance Review Date: 10/27/98

NOV-12-98 THU 15:31

BLDG 881 ROOM 112

FAX NO. 303 988 3400

P.03

NOV-12-98 06:29 PM

P.02

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190001-002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-01

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 7S423

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
110-86-1-----	pyridine	100	U
106-46-7-----	1,4-dichlorobenzene	100	U
95-48-7-----	o-cresol	261	
106-44-5-----	m,p-cresol	296	
67 72-1-----	hexachloroethane	100	U
98-95-3-----	nitrobenzene	100	U
87-68-3-----	hexachlorobutadiene	100	U
86-06-2-----	2,4,6-trichlorophenol	100	U
95-95-4-----	2,4,5-trichlorophenol	100	U
121-14-2-----	2,4-dinitrotoluene	100	U
118-74-1-----	hexachlorobenzene	100	U
87-86-5-----	pentachlorophenol	100	U

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P. 03

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

99A3190-002.002

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-02

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 78424

Level: (low/med) LOW

Date Received: 10/29/98

* Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
110-86-1-----	pyridine	100 U	
106-46-7-----	1,4-dichlorobenzene	100 U	
95-48-7-----	o-cresol	282	
106-44-5-----	m,p-cresol	710	
67-72-1-----	hexachloroethane	100 U	
98-95-3-----	nitrobenzene	100 U	
87-68-3-----	hexachlorobutadiene	100 U	
86-06-2-----	2,4,6-trichlorophenol	100 U	
95-95-4-----	2,4,5-trichlorophenol	100 U	
121-14-2-----	2,4-dinitrotoluene	100 U	
118-74-1-----	hexachlorobenzene	100 U	
87-86-5-----	pentachlorophenol	100 U	

JAN-12-99 TUE 10:28
JAN. -11' 99 (MON) 18:45

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FAX NO. 303 866 3400
TEL: 803 769 7376+4028

P. 03
P. 003



GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certificate

STAT#	Q#L	EPI
PL	687156/87294	ES7472/87458
NC	233	
SC	10130	10582
TN	02934	02934

Client: Kaiser Hill Company, L.L.C.
Rocky Flats Environmental Site
Post Office Box 464
Golden, Colorado 80402-0464
Contact: Ms. Virgene Ideker
Project Description: Waste Characteristics

cc: KHCO00497

Report Date: January 11, 1999

Page 1 of 1

Sample ID	: 99A3190-013.001
Lab ID	: 9901103-02
Matrix	: SOLID
Date Collected	: 01/06/99
Date Received	: 01/06/99
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	Units	Method	Analyst	Date	Time	Batch
Extractable Organics								
TCLP Semivolatile Compounds - 12 Items								
o-DICHLOROBENZENE	<	100	ug/l	EPA 8270	MKP	01/08/99	0148	139216
2,4,5-Trichlorophenol	<	250	ug/l	EPA 8270				
2,4,6-Trichlorophenol	<	100	ug/l	EPA 8270				
2,4-Dinitrotoluene	<	100	ug/l	EPA 8270				
Hexachlorobenzene	<	100	ug/l	EPA 8270				
Hexachlorobutadiene	<	100	ug/l	EPA 8270				
Hexachloroethane	<	100	ug/l	EPA 8270				
Nitrobenzene	<	100	ug/l	EPA 8270				
Pentachlorophenol		1080	ug/l	EPA 8270				
Pyridine	<	100	ug/l	EPA 8270				
m,p-Cresol	<	20.0	mg/l	EPA 8270				
o-Cresol	<	20.0	mg/l	EPA 8270				

The following prep procedures were performed:
GC/MS 5970 Extractables
TCLP Extraction - Semivolatiles

EPA 3510
EPA 1311

GMS 01/07/99 1427 139216
JL 01/06/99 1640 139186

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Jack Walker at 7697376.

Reviewed By

P O Box 30712 • Charleston, SC 29417 • 2140 Savage Road • 29414

(843) 556-8171 • Fax (843) 766-1178



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9901103-02

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P.05

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P.04

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

99A3190-003.00L

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-03

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 7S425

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

110-86-1-----	pyridine	100	U
106-46-7-----	1,4-dichlorobenzene	100	U
95-48-7-----	o-cresol	100	U
106-44-5-----	m,p-cresol	100	U
67-72-1-----	hexachloroethane	100	U
98-95-3-----	nitrobenzene	100	U
87-68-3-----	hexachlorobutadiene	100	U
88-06-2-----	2,4,6-trichlorophenol	100	U
95-95-4-----	2,4,5-trichlorophenol	100	U
121-14-2-----	2,4-dinitrotoluene	100	U
118-74-1-----	hexachlorobenzene	100	U
87-86-5-----	pentachlorophenol	100	U

JAN-12-99 TUE 10:27

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FAX NO. 303 988 3400

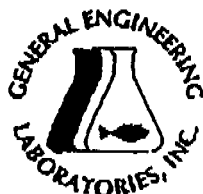
P. 02

JAN. -11' 99(MON) 18:45

GEL MRKTNG/ACCT/QUAL

TEL: 803 769 7376+4028

P. 002



GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPA
FL	E27156/87294	E27472/87458
NC	233	
SC	10120	10382
TN	02934	02934

Client: Kaiser Hill Company, L.L.C.
Rocky Flats Environmental Site
Post Office Box 464
Golden, Colorado 80402-0464

Contact: Ms. Virgine Ideker
Project Description: Waste Characteristics

cc: KHCO00497

Report Date: January 11, 1999

Page 1 of 1

Sample ID : 99A3190-012.001
Lab ID : 9901103-01
Matrix : SOLID
Date Collected : 01/06/99
Date Received : 01/06/99
Priority : Rush
Collector : Client

Parameter	Qualifier	Result	Units	Method	Analyst	Date	Time	Batch
Extractable Organics								
<i>TCLP Semivolatile Compounds - 12 Items</i>								
o-DICHLOROBENZENE	<	100	ug/l	EPA 8270	MKP	01/08/99	0115	139216
2,4,5-Trichlorophenol	<	250	ug/l	EPA 8270				
2,4,6-Trichlorophenol	<	100	ug/l	EPA 8270				
2,4-Dinitrophenols	<	100	ug/l	EPA 8270				
Hexachlorobenzene	<	100	ug/l	EPA 8270				
Hexachlorobutadiene	<	100	ug/l	EPA 8270				
Hexachloroethane	<	100	ug/l	EPA 8270				
Nitrobenzene	<	100	ug/l	EPA 8270				
Pentachlorophenol	<	250	ug/l	EPA 8270				
Pyridine	<	100	ug/l	EPA 8270				
m,p-Cresol	<	20.0	mg/l	EPA 8270				
o-Cresol	<	20.0	mg/l	EPA 8270				

The following prep procedures were performed:

GC/MS 5970 Extractables

EPA 3510

GMS 01/07/99 1427 139216

TCLP Extraction - Semivolatiles

EPA 1311

JL 01/06/99 1640 139186

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Jack Walker at 7697376.

Reviewed By

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9901103-01

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P.05

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190-004.002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 98110E02-04

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 5T230

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/10/98

Injection Volume: 1.0 (uL)

Dilution Factor: 40.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
110-86-1	pyridine	4000	U
106-46-7	1,4-dichlorobenzene	4000	U
95-48-7	o-cresol	4000	U
106-44-5	m,p-cresol	4000	U
67-72-1	hexachloroethane	4000	U
98-95-3	nitrobenzene	4000	U
87-68-3	hexachlorobutadiene	4000	U
88-06-2	2,4,6-trichlorophenol	4000	U
95-95-4	2,4,5-trichlorophenol	4000	U
121-14-2	2,4-dinitrotoluene	4000	U
118-74-1	hexachlorobenzene	4000	U
87-86-5	pentachlorophenol	4000	U

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

99A3190001MSD

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: QC557681

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 79422

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.

COMPOUND

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

Q

110-86-1-----	pyridine	547	
106-46-7-----	1,4-dichlorobenzene	789	
95-48-7-----	o-cresol	987	
106-44-5-----	m,p-cresol	386	
67-72-1-----	hexachloroethane	792	
98-95-3-----	nitrobenzene	756	
87-68-3-----	hexachlorobutadiene	835	
88-06-2-----	2,4,6-trichlorophenol	893	
95-95-4-----	2,4,5-trichlorophenol	996	
121-14-2-----	2,4-dinitrotoluene	1050	
118-74-1-----	hexachlorobenzene	921	
87-86-5-----	pentachlorophenol	1140	

NOV-12-98 THU 15:35

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1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

99A3190001MS

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: QC557680

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 78421

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/06/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
---------	----------	--	---

110-86-1-----	pyridine	428	
106-46-7-----	1,4-dichlorobenzene	763	
95-48-7-----	o-cresol	915	
106-44-5-----	m,p-cresol	394	
67-72-1-----	hexachloroethane	770	
98-95-3-----	nitrobenzene	671	
87-68-3-----	hexachlorobutadiene	790	
88-06-2-----	2,4,6-trichlorophenol	824	
95-95-4-----	2,4,5-trichlorophenol	956	
121-14-2-----	2,4-dinitrotoluene	1010	
118-74-1-----	hexachlorobenzene	912	
87-86-5-----	pentachlorophenol	1120	

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BLDG 881 ROOM 112

FAX NO. 303 868 3400

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P. 08

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

SBLK01LCS

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: QC557679

Sample wt/vol: 1000 (g/mL) ML

Lab File ID: 78420

Level: (low/med) LOW

Date Received: 11/03/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
110-86-1	pyridine	44.9	
106-46-7	1,4-dichlorobenzene	70.0	
95-48-7	o-cresol	61.3	
106-44-5	m,p-cresol	48.2	
67-72-1	hexachloroethane	67.5	
98-95-3	nitrobenzene	71.4	
87-68-3	hexachlorobutadiene	87.4	
88-06-2	2,4,6-trichlorophenol	75.1	
95-95-4	2,4,5-trichlorophenol	75.5	
121-14-2	2,4-dinitrotoluene	83.8	
118-74-1	hexachlorobenzene	96.0	
87-86-5	pentachlorophenol	77.1	

NOV-12-98 THU 15:34 BLDG 881 ROOM 112
NOV-12-98 06:31 PM

FAX NO. 303 986 3400

P. 08
P. 07

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

TCLPBLANK

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: 99A3190

Matrix: (soil/water) TCLP Lab Sample ID: QC557678

Sample wt/vol: 100.0 (g/mL) ML Lab File ID: 75419

Level: (low/med) LOW Date Received: 11/05/98

% Moisture: _____ decanted: (Y/N) _____ Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL) Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
110-86-1	pyridine	100	U
106-46-7	1,4-dichlorobenzene	100	U
95-48-7	o-cresol	100	U
106-44-5	m,p-cresol	100	U
67-72-1	hexachloroethane	100	U
98-95-3	nitrobenzene	100	U
87-68-3	hexachlorobutadiene	100	U
88-06-2	2,4,6-trichlorophenol	100	U
95-95-4	2,4,5-trichlorophenol	100	U
121-14-2	2,4-dinitrotoluene	100	U
118-74-1	hexachlorobenzene	100	U
87-86-5	pentachlorophenol	100	U

NOV-12-98 THU 15:33

BLDG 881 ROOM 112

FAX NO. 303 968 3400

P.07

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P.06

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SBLK01

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: QC557677

Sample wt/vol: 1000 (g/mL) ML

Lab File ID: 7S418

Level: (low/med) LOW

Date Received: 11/05/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

110-86-1-----	pyridine	10.0	U
106-46-7-----	1,4-dichlorobenzene	10.0	U
95-48-7-----	o-cresol	10.0	U
106-44-5-----	m,p-cresol	10.0	U
67-72-1-----	hexachloroethane	10.0	U
98-95-3-----	nitrobenzene	10.0	U
87-68-3-----	hexachlorobutadiene	10.0	U
88-06-2-----	2,4,6-trichlorophenol	10.0	U
95-95-4-----	2,4,5-trichlorophenol	10.0	U
121-14-2-----	2,4-dinitrotoluene	10.0	U
118-74-1-----	hexachlorobenzene	10.0	U
87-86-5-----	pentachlorophenol	10.0	U

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BLDG 881 ROOM 112

FAX NO. 303 988 3400

P.02

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190001.002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-01

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 7S423

Level: (low/med) LOW

Date Received: 10/29/98

% Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
---------	----------	--	---

110-86-1-----	pyridine	100	U
106-46-7-----	1,4-dichlorobenzene	100	U
95-48-7-----	o-cresol	261	
106-44-5-----	m,p-cresol	296	
67-72-1-----	hexachloroethane	100	U
98-95-3-----	nitrobenzene	100	U
87-68-3-----	hexachlorobutadiene	100	U
88-06-2-----	2,4,6-trichlorophenol	100	U
95-95-4-----	2,4,5-trichlorophenol	100	U
121-14-2-----	2,4-dinitrotoluene	100	U
118-74-1-----	hexachlorobenzene	100	U
87-86-5-----	pentachlorophenol	100	U

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BLDG 881 ROOM 112

FAX NO. 303 866 3400

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GENERAL ENGINEERING

P.03

12
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190-002.002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDG No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-02

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 78424

Level: (low/high) LOW

Date Received: 10/29/98

* Moisture: _____ Decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

110-86-1-----	pyridine	100	U
106-46-7-----	1,4-dichlorobenzene	100	U
95-48-7-----	o-cresol	252	
106-44-5-----	m,p-cresol	710	
67-72-1-----	hexachloroethane	100	U
98-95-3-----	nitrobenzene	100	U
87-68-3-----	hexachlorobutadiene	100	U
88-06-2-----	2,4,6-trichlorophenol	100	U
95-95-4-----	2,4,5-trichlorophenol	100	U
121-14-2-----	2,4-dinitrotoluene	100	U
118-74-1-----	hexachlorobenzene	100	U
87-86-5-----	pentachlorophenol	100	U

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GENERAL ENGINEERING

P.04

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190-003.002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDS No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 9810E02-03

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 78425

Level: (low/med) LOW

Date Received: 10/29/98

Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/05/98

Injection Volume: 1.0 (uL)

Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L Q

110-86-1	pyridine	100	U
106-46-7	1,4-dichlorobenzene	100	U
95-48-7	o-cresol	100	U
106-44-5	m,p-cresol	100	U
57-72-1	hexachloroethane	100	U
96-25-3	nitrobenzene	100	U
87-68-3	hexachlorobutadiene	100	U
88-06-2	2,4,6-trichlorophenol	100	U
95-95-4	2,4,5-trichlorophenol	100	U
121-14-2	2,4-dinitrotoluene	100	U
118-74-1	hexachlorobenzene	100	U
87-86-5	pentachlorophenol	100	U

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BLDG 881 ROOM 112

FAX NO. 303 866 3400

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GENERAL ENGINEERIN

P.05

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

99A3190-004.002

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA

Case No.: NA

SAS No.: NA

SDS No.: 99A3190

Matrix: (soil/water) TCLP

Lab Sample ID: 98110E02-04

Sample wt/vol: 100.0 (g/mL) ML

Lab File ID: 5T230

Level: (low/med) LOW

Date Received: 10/29/98

* Moisture: _____ decanted: (Y/N) _____

Date Extracted: 11/05/98

Concentrated Extract Volume: 1.00 (mL)

Date Analyzed: 11/10/98

Injection Volume: 1.0 (uL)

Dilution Factor: 40.0

GPC Cleanup: (Y/N) N

pH: 7.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L Q

110-86-1-----	pyridine	4000	U
106-46-7-----	1,4-dichlorobenzene	4000	U
95-48-7-----	o-cresol	4000	U
106-44-5-----	m,p-cresol	4000	U
67-72-1-----	hexachlorocyclohexane	4000	U
98-95-3-----	nitrobenzene	4000	U
87-68-3-----	hexachlorobutadiene	4000	U
88-06-2-----	2,4,6-trichlorophenol	4000	U
95-95-4-----	2,4,5-trichlorophenol	4000	U
121-14-2-----	2,4-dinitrotoluene	4000	U
118-74-1-----	hexachlorobenzene	4000	U
87-86-5-----	pentachlorophenol	4000	U

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BLDG 881 ROOM 112.

FAX NO. 303 988 3400

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GENERAL ENGINEERING

P. 02

General Engineering Laboratories**Form 1: Inorganic Analysis Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-04

Client ID: 99A3190-004.002

Contract: KHCO00497

Lab Code: OEL

Case No.:

SAS No.:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-3	Aluminum	124	µg/L	U		P	124	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	4.1	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	17.4	µg/L			P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	204	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.22	µg/L	B		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	1620	µg/L			P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	21200	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	17.2	µg/L			P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	0.86	µg/L	B		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	52.8	µg/L			P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	38.5	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-82-1	Lead	15.6	µg/L			P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HP ICPMS	nov0998.17
7439-93-4	Magnesium	2650	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	157	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	10.9	µg/L	U		P	10.9	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	16700	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	9.2	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-3	Sodium	1440000	µg/L			P	25.7	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	135	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace ICPAES	981109-2
7440-31-3	Tin	5.0	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	1.0	µg/L	B		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	2670	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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BLDG 881 ROOM 112

FAX NO. 303 986 3400

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GENERAL ENGINEERING

P.03

General Engineering Laboratories**Form 1: Inorganic Analysis Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-05

Client ID: 99A3190-005.002

Contract: KH0000497

Lab Code: GEL

Case No:

SAS No:

Matrix: TCLP

Data Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	124	µg/L	U		P	124	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	323	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	25000	µg/L			P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	1.8	µg/L	B		P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.13	µg/L	U		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	3.0	µg/L	B		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	18100	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	5280	µg/L			P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	0.82	µg/L	U		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	36500	µg/L			P	7.4	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	24.8	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	1.5	µg/L	U		P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HP ICPAES	nov0998.17
7439-95-4	Magnesium	5890	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	757	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	10.9	µg/L	U		P	10.9	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	19800	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	26.9	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1450000	µg/L			P	25.7	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	47.8	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace ICPAES	981109-2
7440-31-5	Tin	4.4	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	0.95	µg/L	B		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	1450	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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BLDG 881 ROOM 112

FAX NO. 303 966 3400

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GENERAL ENGINEERIN

P.04

General Engineering Laboratories**Form 1: Inorganic Analysis Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-06

Client ID: 99A3190-006.002

Contract: KH0000497

Lab Code: GEL

Case No.:

SAS No.:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	3490	µg/L			P	12.4	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	5.3	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	12.5	µg/L			P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	105	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.85	µg/L	B		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	7.7	µg/L			P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	64400	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	8.4	µg/L	B		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	0.82	µg/L	U		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	18.7	µg/L			P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	373	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	3.6	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HP ICPMS	nov0998.17
7439-95-4	Magnesium	1470	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	280	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	27.2	µg/L	U		P	27.2	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	21400	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	8.7	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1540000	µg/L			P	64.3	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	85.6	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-31-5	Tin	4.0	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	0.89	µg/L	B		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	11000	µg/L			P	65.2	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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FAX NO. 303 988 3400

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GENERAL ENGINEERIN

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General Engineering Laboratories**Form 1: Inorganic Analyses Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-07

Client ID: 99A3190-007.002

Contract: KHC000497

Lab Code: GEL

Case No.:

SAS No.:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	99.0	µg/L			P	12.4	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	8.5	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	5.9	µg/L	B		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	103	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.13	µg/L	U		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	2.2	µg/L	B		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	1290000	µg/L			P	250	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	1.8	µg/L	B		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	1.1	µg/L	B		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	14.7	µg/L			P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	160	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	7.3	µg/L			P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HPICPMS	nov0998.17
7439-95-4	Magnesium	8560	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	490	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.83	µg/L	B		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	27.2	µg/L	U		P	27.2	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	109000	µg/L		N	P	580	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	7.2	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1550000	µg/L			P	64.3	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	6190	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	7.6	µg/L	B		P	4.0	TJA61 Trace ICPAES	981109-2
7440-31-5	Tin	2.6	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	9.3	µg/L	B		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	200	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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BLDG 881 ROOM 112

FAX NO. 303 866 3400

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GENERAL ENGINEERING

P. 06

General Engineering Laboratories**Form 1: Inorganic Analyses Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810B02-08

Client ID: 99A3190-008.002

Contract: KHCO00497

Lab Code: GEL

Case No.:

SAS No.:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-3	Aluminum	1760	µg/L			P	124	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	5.7	µg/L	B		P	2.3	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	8.5	µg/L	B		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	91.4	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.61	µg/L	B		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	1.1	µg/L	U		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	1290000	µg/L			P	99.9	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	6.8	µg/L	B		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	8.6	µg/L	B		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	11.2	µg/L			P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	10300	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	8.9	µg/L			P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HF ICPMS	nov98.17
7439-95-4	Magnesium	308000	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-3	Manganese	2310	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	2.9	µg/L	B		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	15.6	µg/L			P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	9680	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	7.5	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	7970	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	13000	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	5.5	µg/L	B		P	4.0	TJA61 Trace ICPAES	981109-2
7440-31-5	Tin	2.5	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	8.3	µg/L	B		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	335	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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FAX NO. 303 868 3400

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GENERAL ENGINEERIN

P. 07

General Engineering Laboratories**Form 1: Inorganic Analyses Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-09

Client ID: 99A3190-009.002

Contract: KH0000497

Lab Code: GEL

Cann No.:

SAS No.:

Matrix: TCLP

Data Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	124	µg/L	U		P	124	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	2.5	µg/L	U		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	6.1	µg/L	B		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	77.1	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.13	µg/L	U		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	1.1	µg/L	U		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	6800	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	6.5	µg/L	B		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	50.1	µg/L			P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	2.6	µg/L	B		P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	69.6	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	1.5	µg/L	U		P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HF ICPMS	981109-4
7439-95-4	Magnesium	833	µg/L			P	2.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	200	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	10.9	µg/L	U		P	10.9	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	5930	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	7.8	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1570000	µg/L			P	25.7	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	27.8	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace2 ICPAES	981109-2
7440-31-5	Tin	4.3	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	0.67	µg/L	U		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	6290	µg/L			P	26.1	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

General Engineering Laboratories**Form 1: Inorganic Analyses Data Sheet**

SDG No: 99A3190

Method Type: Total Metals

Sample ID: 9810E02-10

Client ID: 99A3190-010.002

Contract: KHCO00497

Lab Code: GEL

Case No:

SAS No:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	12.4	µg/L	U		P	12.4	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	5.3	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	5.3	µg/L	B		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	77.2	µg/L			P	0.23	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.25	µg/L	B		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	4.7	µg/L	B		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	40700	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	1.9	µg/L	B		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	98.3	µg/L			P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	6.7	µg/L	B		P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	103	µg/L			P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	1.5	µg/L	U		P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HP ICPMS	nov0998.17
7439-95-4	Magnesium	4410	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-3	Manganese	6850	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	27.2	µg/L	U		P	27.2	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	25000	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	6.6	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1490000	µg/L			P	64.3	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	302	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace ICPAES	981109-2
7440-31-5	Tin	3.4	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	0.67	µg/L	U		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	2560	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

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GENERAL ENGINEERING

P. 09

General Engineering Laboratories**Form 1: Inorganic Analyses Data Sheet**

SDG No.: 99A3190

Method Type: Total Metals

Sample ID: 9810B02-11

Client ID: 99A3190-011.002

Contract: KHCO00497

Lab Code: GEL

Case No.:

BAS No.:

Matrix: TCLP

Date Received: 10/29/98

Level: LOW

% Solids: 0.00

CAS No.	Analyte	Concentration	Units	C	Qual	M	DL	Instrument ID	Analytical Run
7429-90-5	Aluminum	124	µg/L	U		P	124	TJA61 Trace2 ICPAES	981109-4
7440-36-0	Antimony	2.5	µg/L	U		P	2.5	TJA61 Trace2 ICPAES	981109-4
7440-38-2	Arsenic	6.3	µg/L	B		P	4.0	TJA61 Trace2 ICPAES	981109-4
7440-39-3	Barium	39.9	µg/L			P	0.25	TJA61 Trace2 ICPAES	981109-4
7440-41-7	Beryllium	0.13	µg/L	U		P	0.13	TJA61 Trace2 ICPAES	981109-4
7440-43-9	Cadmium	1.1	µg/L	U		P	1.1	TJA61 Trace2 ICPAES	981109-4
7440-70-2	Calcium	1600	µg/L			P	10.0	TJA61 Trace2 ICPAES	981109-4
7440-47-3	Chromium	0.70	µg/L	U		P	0.70	TJA61 Trace2 ICPAES	981109-4
7440-48-4	Cobalt	5.1	µg/L	B		P	0.82	TJA61 Trace2 ICPAES	981109-4
7440-50-8	Copper	1.5	µg/L	B		P	0.74	TJA61 Trace2 ICPAES	981109-4
7439-89-6	Iron	12.6	µg/L	B		P	2.5	TJA61 Trace2 ICPAES	981109-4
7439-92-1	Lead	1.5	µg/L	U		P	1.5	TJA61 Trace2 ICPAES	981109-4
7439-93-2	Lithium	2.2	µg/L	U		P	2.2	HP ICPMS	nov0998.17
7439-95-4	Magnesium	147	µg/L			P	8.8	TJA61 Trace2 ICPAES	981109-4
7439-96-5	Manganese	36.5	µg/L			P	0.34	TJA61 Trace2 ICPAES	981109-4
7439-98-7	Molybdenum	0.81	µg/L	U		P	0.81	TJA61 Trace2 ICPAES	981109-4
7440-02-0	Nickel	10.9	µg/L	U		P	10.9	TJA61 Trace2 ICPAES	981109-4
7440-09-7	Potassium	492	µg/L		N	P	23.2	TJA61 Trace2 ICPAES	981109-4
7782-49-2	Selenium	9.7	µg/L			P	2.4	TJA61 Trace2 ICPAES	981109-4
7440-22-4	Silver	2.0	µg/L	U		P	2.0	TJA61 Trace2 ICPAES	981109-4
7440-23-5	Sodium	1430000	µg/L			P	25.7	TJA61 Trace2 ICPAES	981109-4
7440-24-6	Strontium	16.8	µg/L			P	0.19	TJA61 Trace2 ICPAES	981109-4
7440-28-0	Thallium	4.0	µg/L	U		P	4.0	TJA61 Trace2 ICPAES	981109-2
7440-31-5	Tin	3.1	µg/L	B		P	1.5	TJA61 Trace2 ICPAES	981109-4
7440-61-1	Uranium	14.8	µg/L	U		P	14.8	TJA61 Trace2 ICPAES	981109-4
7440-62-2	Vanadium	0.67	µg/L	U		P	0.67	TJA61 Trace2 ICPAES	981109-4
7440-66-6	Zinc	52.5	µg/L			P	2.6	TJA61 Trace2 ICPAES	981109-4

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments:

APPENDIX C

ASBESTOS CHARACTERIZATION RESULTS

***Asbestos Characterization Report for the Building 788/207 Clarifier
(RF/RMRS-98-282.UN, Rev. 0)***



**Rocky Mountain
Remediation Services, L.L.C.**
. . . protecting the environment

**Asbestos Characterization Report
For The Building 788/207 Clarifier**

Rocky Flats Environmental Technology Site

Prepared by:

Scientific Ecology Group for

Rocky Mountain Remediation Services, LLC

**Revision 0
October 19, 1998**

ACRONYMS

ACBM Asbestos containing building materials
AHERA Asbestos Hazard Emergency Response Act
EPA United States Environmental Protection Agency
NIST National Institute of Standards and Technology
NVLAP National Voluntary Laboratory Accreditation Program
PLM Polarized light microscopy
SAP Sampling and Analysis Plan
TSI Thermal systems insulation

ASBESTOS CHARACTERIZATION REPORT FOR THE BUILDING 788/207 CLARIFIER

1.0 INTRODUCTION

During the week of October 5-9, 1998, Building 788/207 Clarifier was inspected for the presence of asbestos containing building materials (ACBM). The purpose of this inspection was to facilitate the decommissioning and demolition of the facility.

Suspect materials not discovered during the initial inspection may be discovered during the "strip-out" of equipment and building materials as the buildings are prepared for demolition. For example, radiological surveys will require the removal of layers of building materials to confirm levels prior to disposal. As such, an addendum will be created to include information on these materials as they are discovered.

The asbestos inspection was conducted according to the guidelines set forth by the Asbestos Hazard Emergency Response Act (AHERA) and complies with the United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA) and State of Colorado regulations covering asbestos inspections.

The enclosed report contains the estimated quantities, physical assessment, location and descriptions of all materials either assumed or identified through sampling and analysis to be asbestos containing. A corrected table (Table 2-1 Asbestos Survey results/Sampling Requirements in the *Building 788/207 Clarifier Asbestos Sampling and Analysis Plan RMRS 1998*) 2-1 is included, with additions (in brackets and bold type.)

2.0 ASBESTOS SURVEY

2.1 INSPECTION PROCEDURES

Bulk samples were acquired to determine the presence of asbestos in building materials. Suspect materials were chosen based on historical significance or on the judgement of the accredited inspector. Each sample was assigned an individual number made up of the building number, the date the sample was acquired, the initials of the sampling technician, and a three digit number in sequence. Quality Control samples are designated in the Bulk Sample Data Table as (QC).

As of the date of this report (10/14/1998), a total of twenty (20) samples were acquired by GTS staff from suspected materials. These materials included thermal systems insulation (TSI), surfacing and miscellaneous materials. All samples were acquired in a random manner representative of the suspected material.

All bulk samples were analyzed by Reservoirs Environmental Services, Inc. (RESI) of Denver, Colorado. RESI is accredited through the National Institute of Standards and Technology (NIST) and participates in the NIST National Voluntary Laboratory Accreditation Program (NVLAP) as required by the EPA. Bulk samples were analyzed by Polarized Light Microscopy (PLM) in compliance with guidelines established by the EPA 40 CFR 763, Subpart F, Appendix A. Asbestos concentrations were visually estimated and reported in percent by layer of each sample.

2.2 DESCRIPTION AND HAZARD ASSESSMENT OF ACM

Remnants of a tar paper roofing material on the roof of the 207 Clarifier was sampled and that sample was analyzed for asbestos. Analytical results indicate no detectable levels of asbestos.

3.0 DISCUSSION OF PLAN -VS- REPORT OUTCOME

In an effort to meet project needs, careful study of the *Building 788/207 Sampling and Analysis Plan (RMRS, October, 1998)* was necessary. During the subsequent sampling effort, certain corrections were necessary. In addition, laboratory data was cross-matched to field data. Discussion of the findings and corrections follows.

Please refer to Appendix C, Table 6-1 Revised ACBM Summary Chart. Corrections are shown in [**bold type in brackets**].

3.1 Corrections to Sampling and Analysis Plan

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements. During the sampling effort, it was discovered that one additional sample was necessary to adequately characterize the facility. The roofing materials on the porches of T788A were not included in the Plan (RMRS 1998). The inspector determined that these are suspect asbestos containing materials, and that one sample would be representative of these materials.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for wiring insulation for the baseboard heater in the B788 south-east office. Discovery work by the inspector in the field determined that no suspect asbestos containing wiring insulation was present at the time of inspection. Therefore, this sample requirement was omitted.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for floor tile and mastic in the B788 south-west office. Discovery work by the inspector in the field determined that the tile in both offices was identical and most likely installed at the same time. Therefore, no sample of the floor tile and mastic in the south-west office was acquired.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for sampling the black mastic on the main floor in the south side of B788. Radiological surveys indicate low level fixed activity in several locations. In addition to radiological issues, discovery work by the inspector in the field determined that the floor mastic was similar to non-asbestos epoxy coatings used in similar applications. Therefore, no sample of the floor mastic was acquired.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for sampling the domestic water pipe mudded fitting insulation to the safety shower. Discovery by the inspector in the field determined that this system was homogeneous to mudded fittings previously sampled. Therefore, no sample was acquired at this location.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for sampling the pipe insulation located in a manhole in B788. Discussions with project staff indicated that this insulation would be out of the scope of this project. Therefore, no sample was acquired at this location.

In the Sampling and Analysis Plan (RMRS, 1998), Table 2-1 described sampling requirements for arc chutes in the B788 main electrical service. No arc chutes were observed at the time of inspection. Therefore, no sampling was required.

Appendix A
Inspector Certifications

Appendix B

Bulk Asbestos Sample Lab/Data Table

**ASBESTOS CHARACTERIZATION REPORT
FOR THE BUILDING 788/207 CLARIFIER**

RF/RMRS-98-282 UN
Rev. 0, Page B-3 of B-3
Date Effective: 10/19/98

Sample Number	Sample Description and Location	Lab Result PLM (PC)
788-981008-MS-014	TSI VBM on a domestic water pipe union; from B788 safety shower, 3' S of center west door, 4' W of E wall, 7' from the floor.	A: ND B: ND
788-981008-MS-015	Drywall, tape and joint compound; from B788 permacon, SE interior corner, 5' from the floor.	A: ND B: ND C: ND
788-981008-MS-016	Drywall, tape and joint compound; from B788 permacon, E interior wall, 8' N of S entry, 5' from the floor.	A: ND B: ND C: ND
788-981008-MS-017	TSI mud on a sludge recycle valve V-13; from 207 Clarifier, 3' W of E wall, 11' N of S wall.	A: ND
788-981008-MS-018	Yellow/green fixative paint; from 207 Clarifier tank, 3' SE of center.	A: ND
788-981008-MS-019	Sample omitted as suspect material by CAI: fiberglass TSI.	None
788-981008-MS-020 (QA)	Drywall, tape and joint compound; from B788 permacon, E exterior wall, 9' N of SE corner, 5' from the floor.	A: ND B: ND C: ND
788-981008-MS-021	Tar paper roofing matl.; from 207 Clarifier roof, 2' W of N entry, 6' from the edge.	A: ND
788-981008-MS-022	Roofing tar (A) and asphalt shingle; from T788A south porch roof, 3' E of porch/trailer joint, N edge.	A: ND B: 10% C: ND D: ND

Note: ND means None Detected; TR means Trace; PLM means Polarized Light Microscopy; PC means Point Count.

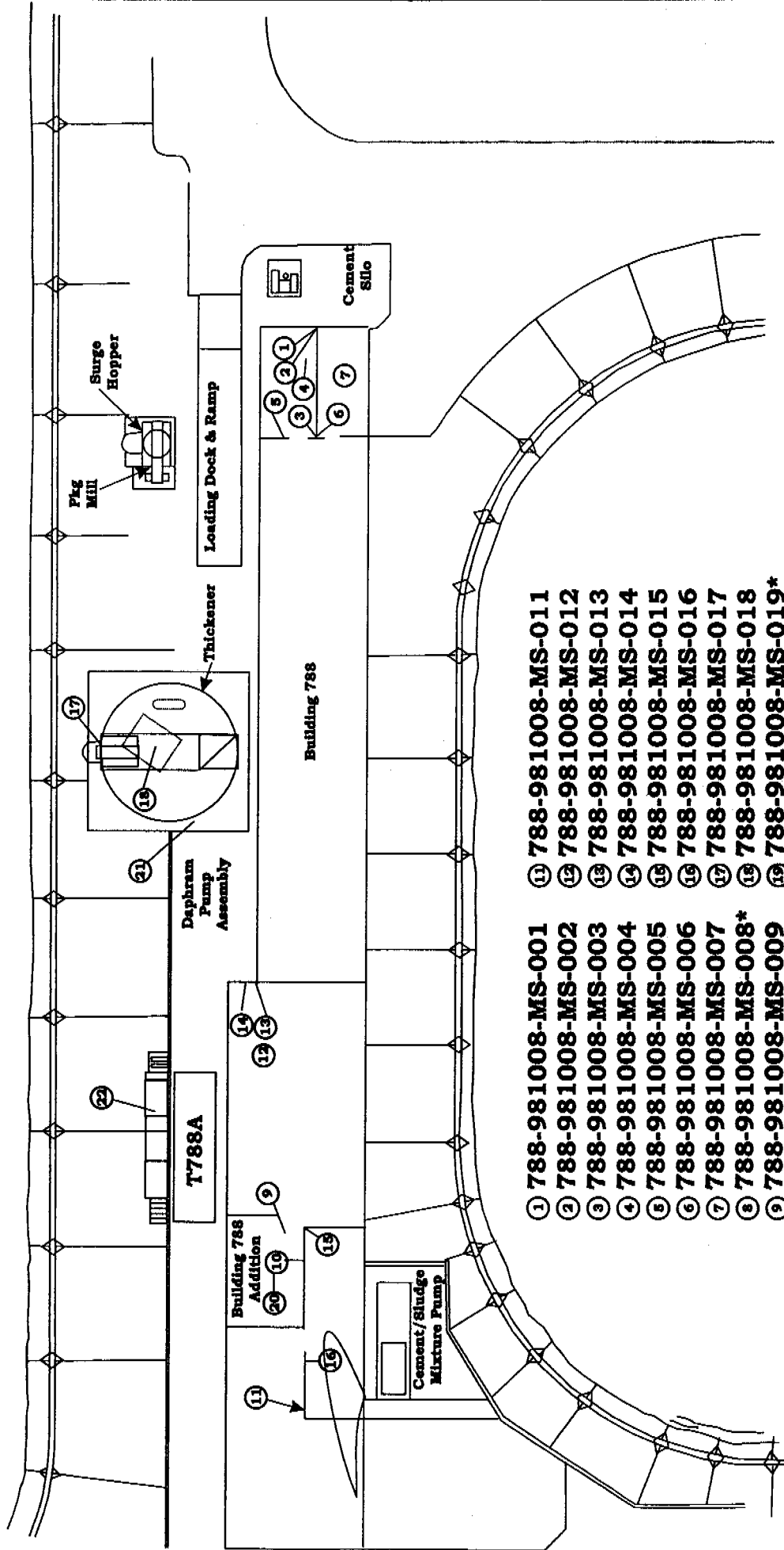
**ASBESTOS CHARACTERIZATION REPORT
FOR THE BUILDING 788/207 CLARIFIER**

RF/RMRS-98-282.UN
Revision 0
Date Effective: 10/19/98

Attachment 1
Bulk Asbestos Sample Drawing



Attachment 1 Bulk Asbestos Sample Drawing



- | | |
|----------------------|----------------------|
| ① 788-981008-MS-001 | ⑪ 788-981008-MS-011 |
| ② 788-981008-MS-002 | ⑫ 788-981008-MS-012 |
| ③ 788-981008-MS-003 | ⑬ 788-981008-MS-013 |
| ④ 788-981008-MS-004 | ⑭ 788-981008-MS-014 |
| ⑤ 788-981008-MS-005 | ⑮ 788-981008-MS-015 |
| ⑥ 788-981008-MS-006 | ⑯ 788-981008-MS-016 |
| ⑦ 788-981008-MS-007 | ⑰ 788-981008-MS-017 |
| ⑧ 788-981008-MS-008* | ⑱ 788-981008-MS-018 |
| ⑨ 788-981008-MS-009 | ⑲ 788-981008-MS-019* |
| ⑩ 788-981008-MS-010 | ⑳ 788-981008-MS-020 |
| | ㉑ 788-981008-MS-021 |
| | ㉒ 788-981008-MS-022 |

* Sample not acquired

**ASBESTOS CHARACTERIZATION REPORT
FOR THE BUILDING 788/207 CLARIFIER**

RF/RMRS-98-282.UN
Revision 0
Date Effective: 10/19/98

Attachment 2
Laboratory Data

**GENERAL ENGINEERING LABORATORIES***Meeting today's needs with a vision for tomorrow.*

JAN 14 1999

January 12, 1999

Virgene Idcker
Kaiser Hill Company, L.L.C.
Rocky Flats Environmental Site
Post Office Box 464
Golden, CO 80402-0464

Dear Ms. Idcker:

I am sending you the Data Package from the Rocky Flats Environmental Site (RIN# 99A3190#003) for the Sample Delivery Group (SDG) 99A3190#003. The samples were analyzed for GC/MS Semivolatile Organics. Per our telephone conversation earlier today, please make note that sample number 99A3190-004.002 was "relogged" as sample number 99A3190-012.002 and sample number 99A3190-003.002 was relogged as sample number 99A3190-013.002.

General Engineering Laboratories appreciates this opportunity to provide you with analytical results, and trusts that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171.

Yours very truly,

Jack Walker
Project Manager

enclosure

Rocky Flats Environmental Technology Site

Golden, CO 80402-0464

Safety and Hygiene Chain of Custody Record and Analysis Request

FFP F 3791.32 (7/85)
Formerly RF-47630

Name of Originator: Mike Schickel *THIS: C.A.T.* Bldg/Ext: 730.J / 4215 Date: Oct 9, 1983 Page 1 of 2

SAMPLE NUMBER Bldg/Yr/ID/P/IS#	ANALYZE FOR	VOLUME liters	SAMPLE TIME/	MEDIA	P A B	Personal Area Bulk	REMARKS	Lab Number
788-981008-MS-001	PM-Asbestos				B	99-20110-001-001 (Asbestos)		
002					B	002		
003					B	003		
004					B	004		
005					B	005		
006					B	006		
007					B	007		
008					B	008		
010					B	010		
011					B	011		
012					B	012		
013					B	013		
014					B	014		
015					B	015		
016					B	016		
788-981008-MS-017	PM-Asbestos				B	99-20110-017-001 (Asbestos)		
Relinquished by	Received by	Time/Date	Relinquished by	Received by	Time/Date			
Relinquished by	Received by	Time/Date	Relinquished by	Received by	Time/Date			
Relinquished by	Received by	Time/Date	Relinquished by	Received by	Time/Date			
Relinquished by	Received by	Time/Date	Relinquished by	Received by	Time/Date			
<p>Report and Billing Instruction</p> <p>Kaiser-Hill <input type="checkbox"/> Verbal To: M. Schickel</p> <p>RMRS <input checked="" type="checkbox"/> Fax To: 965-6538</p> <p>SSOC <input type="checkbox"/> Report To: KH</p> <p>DynCorp <input type="checkbox"/> Bill To: KH</p> <p>WSI <input type="checkbox"/> P.O.#/Release: MA78CH80</p> <p>Lab: R 053</p>								
<p>Seal# (Release #) 99-20110</p> <p>Condition of Seal: <input type="checkbox"/> Broken <input type="checkbox"/> Unbroken</p> <p>Signature: _____</p> <p>Comments: _____</p>								

White - Return to Originator Yellow - Lab Copy Green - Sample Custodian Blue - Originator

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

NVLAP Accredited Laboratory #1896

Page 1 of 4

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number:

Client:

Client Project:

Data Samples Received:

Analysis Type:

Turnaround:

RES 55171-1

Kaiser-Hill Company, LLC

9820110, On Site Sample Analysis, Mike Schuiterbusch

October 13, 1998

PLM Short Report, Bulk

24 Hour

Note: The US EPA requires use of stratified analysis for NESHAP and AHERA compliance. Composite results only apply for specific exceptions.

Client Sample Number	Lab ID Number	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT		Non-Fibrous Components (%)									
				BY LAYER	Visual Estimate (%)	C	G	L	S	T	H	A	N	I	R
788-981008MS-001	EM 368740	A White resinous material w/yellow fibrous material	3	ND	ND	0	10	0	0	0	0	0	0	0	0
		B White resinous material w/white fibrous woven material	7	ND	ND	0	50	0	0	1	0	0	0	0	0
		C Gray fibrous plaster	90	ND	ND	5	15	0	0	0	0	0	0	0	0
788-981008MS-002	EM 368741	A White resinous material w/white fibrous woven material	3	ND	ND	0	50	0	0	1	0	0	0	0	0
		B White resinous material w/yellow fibrous material	17	ND	ND	0	15	0	0	5	0	0	0	0	0
		C Gray fibrous plaster	80	ND	ND	5	20	0	0	0	0	0	0	0	0
788-981008MS-003	EM 368742	A Multicolored paint	5	ND	ND	0	0	0	0	0	0	0	0	0	0
		B White plaster (mud)	10	ND	ND	0	0	0	0	0	0	0	0	0	0
		C Tan/white fibrous material	20	ND	ND	97	0	0	0	0	0	0	0	0	0
		D White plaster	65	ND	ND	5	TR	0	0	0	0	0	0	0	0
788-981008MS-004	EM 368743	A Black tar	10	ND	ND	0	0	0	0	0	0	0	0	0	0
		B White tile	90	ND	ND	0	0	0	0	0	0	0	0	0	0
788-981008MS-005	EM 368744	A Multicolored paint	5	ND	ND	0	0	0	0	0	0	0	0	0	0
		B White plaster (mud)	8	ND	ND	0	0	0	0	0	0	0	0	0	0
		C Tan fibrous material	17	ND	ND	97	0	0	0	0	0	0	0	0	0
		D White plaster	70	ND	ND	5	2	0	0	0	0	0	0	0	0

ND = None Detected

TR = Trace, < 1% Visual Estimate

CELL = Cellulose

ORG = Organic

Trem-Act = Tremolite-Actinolite

WOLL = Wollastonite

BRUC = Brucite

SYNTH = Synthetic

Analyt: PDL

Data QA

0002

RESERVOIRS ENVIRONMENTAL SERVICES, INC.

Page 3 of 4

NVLAP Accredited Laboratory #1898

TABLE I. PLM BULK ANALYSIS, PERCENTAGE COMPOSITION BY VOLUME

RES Job Number:

RES 55171-1

Client:

Kaiser-Hill Company, LLC

Client Project:

99Z0110, On Site Sample Analysis, Mike Schultenbusch

Date Samples Received:

October 13, 1998

Analysis Type:

PLM Short Report, Bulk

Turnaround:

24 Hour

Note: The US EPA requires use of stratified analysis for NESHP and AHERA compliance. Composite results only apply for specific exceptions.

Client Sample Number	Lab ID Number	Physical Description	Portion of Total Sample (%)	ASBESTOS CONTENT		Non-Asbestos Fibrous Components (%)										Non-Fibrous Components (%)	
				BY LAYER	Visual Estimate (%)	C	G	S	H	W	T	O	A	T	H	E	R
788-981008MS-012	EM 368750	A White resinous material w/white fibrous material, white fibrous woven material & silver foil	50	ND	ND	1	4	0	0	10	0	0	0	0	0	0	85
		B Yellow/white fibrous material	50	ND	ND	0	97	0	0	0	0	0	0	0	0	0	3
788-981008MS-013	EM 368751	A White resinous material	40	ND	ND	0	5	0	0	10	0	0	0	0	0	0	85
		B Yellow fibrous material	60	ND	ND	0	95	0	0	0	0	0	0	0	0	0	5
788-981008MS-014	EM 368752	A Silver foil w/white fibrous material & yellow resin	40	ND	ND	50	15	0	0	0	0	0	0	0	0	0	35
		B White resinous material	60	ND	ND	0	0	0	0	10	0	0	0	0	0	0	90
788-981008MS-015	EM 368753	A White plaster w/tan paint	15	ND	ND	0	0	0	0	0	0	0	0	0	0	0	100
		B White tan fibrous material	20	ND	ND	97	0	0	0	0	0	0	0	0	0	0	3
		C White plaster	65	ND	ND	4	4	0	0	0	0	0	0	0	0	0	92
788-981008MS-016	EM 368754	A White plaster w/tan paint	10	ND	ND	0	0	0	0	0	0	0	0	0	0	0	100
		B White tan fibrous material	30	ND	ND	97	0	0	0	0	0	0	0	0	0	0	3
		C White plaster	60	ND	ND	4	4	0	0	0	0	0	0	0	0	0	92
788-981008MS-017	EM 368755	A White fibrous plaster	100	ND	ND	0	3	17	0	0	0	0	0	0	0	0	80
788-981008MS-018	EM 368756	A Gold resin	100	ND	ND	0	0	0	0	0	0	0	0	0	0	0	100

ND = None Detected
 TR = Trace, < 1% Visual Estimate
 CELL = Cellulose
 ORG = Organic
 Trans-Act = Tremolite-Actinolite
 WOLL = Wollastonite
 BRUC = Brucite
 GYP = Gypsum
 SYNTH = Synthetic
 Data UA

10004

**Attachment 3
Bulk Asbestos Sample Photographs**

APPENDIX D

Building 788 Concrete Floor Radiological Data

Preliminary Characterization Surveys.

Building 788 Slab Floor

Description: Building 788 - Slab Floor				
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
Survey Point	Removable α Activity (dpm/100cm ²)	Total α Activity (dpm/100cm ²)	Removable β/γ Activity (dpm/100cm ²)	Total β/γ Activity (dpm/100cm ²)
1	<20	94	<200	1056
2	<20	94	<200	1062
3	<20	94	<200	1107
4	<20	198	<200	1200
5	<20	384	<200	1086
6	<20	132	<200	1296
7	<20	150	<200	621
8	<20	180	<200	1062
9	<20	330	<200	1050
10	<20	558	<200	1287
11	<20	150	<200	1317
12	<20	94	<200	1200
13	<20	204	<200	1104
14	<20	94	<200	1017
15	<20	222	<200	1200
16	<20	336	<200	1158
17	<20	94	<200	1098
18	<20	480	<200	1089
19	<20	94	<200	1113
20	<20	138	<200	1212
21	<20	420	<200	1251
22	<20	804	<200	1281
23	<20	94	<200	1251
24	<20	94	<200	1200
25	<20	150	<200	1242
26	<20	546	<200	1239
27	<20	456	<200	1203
28	<20	94	<200	1188
29	<20	94	<200	1299
30	<20	94	<200	1017
31	<20	162	<200	1203
32	<20	94	<200	1022
33	<20	288	<200	1026
34	<20	300	<200	1263
35	<20	94	<200	1149
36	<20	258	<200	969
37	<20	594	<200	1056
38	<20	94	<200	1005
39	<20	94	<200	1008

Preliminary Characterization Surveys

Building 788 Slab Floor

40	<20	94	<200	942
41	<20	94	<200	1113
42	<20	456	<200	747
43	<20	498	<200	825
44	<20	94	<200	561
45	<20	94	<200	795
46	<20	94	<200	606
47	<20	94	<200	825
48	<20	330	<200	939
49	<20	94	<200	600
50	<20	94	<200	732
51	<20	94	<200	771
52	<20	94	<200	657
53	<20	450	<200	678
54	<20	94	<200	573
55	<20	94	<200	711
56	<20	94	<200	636
57	<20	94	<200	813
58	<20	222	<200	621
59	<20	94	<200	705
60	<20	94	<200	642
61	<20	94	<200	699
62	<20	94	<200	657
63	<20	228	<200	630
64	<20	94	<200	777
65	<20	94	<200	624
66	<20	102	<200	693
67	<20	94	<200	642
68	<20	94	<200	786
69	<20	94	<200	672
70	<20	114	<200	726
71	<20	94	<200	606
72	<20	94	<200	795
73	<20	270	<200	750
74	<20	1542	<200	900
75	<20	94	<200	876
76	<20	94	<200	774
77	<20	94	<200	726
78	<20	94	<200	564
79	<20	1056	<200	966
80	<20	934	<200	960
81	<20	94	<200	717
82	<20	94	<200	513
83	<20	94	<200	360
84	<20	94	<200	492
85	<20	102	<200	882
86	<20	258	<200	1269
87	<20	516	<200	318
88	<20	94	<200	867

Preliminary Characterization Surveys

Building 788 Slab Floor

89	<20	94	<200	657
90	<20	246	<200	1248
91	<20	354	<200	1314
92	<20	94	<200	879
93	<20	94	<200	747
94	<20	288	<200	1068
95	<20	396	<200	1089
96	<20	372	<200	1377
97	<20	384	<200	1257
98	<20	94	<200	648
99	<20	94	<200	792
100	<20	94	<200	801
101	<20	306	<200	1365
102	<20	264	<200	1287
103	<20	94	<200	801
104	<20	94	<200	804
105	<20	66	<200	762
106	<20	342	<200	1296
107	<20	312	<200	1302
108	<20	330	<200	1068
109	<20	94	<200	687
110	<20	168	<200	894
111	<20	94	<200	768
112	<20	300	<200	1239
113	<20	180	<200	816
114	<20	94	<200	849
115	<20	330	<200	1266
116	<20	396	<200	1206
117	<20	252	<200	1302
118	<20	94	<200	888
119	<20	94	<200	639
120	<20	342	<200	1284
121	<20	94	<200	807
122	<20	114	<200	894
123	<20	234	<200	1455
124	<20	342	<200	1389
125	<20	94	<200	750
126	<20	94	<200	621
127	<20	186	<200	1242
128	<20	270	<200	1416
129	<20	252	<200	1272
130	<20	94	<200	894
131	<20	94	<200	750
132	<20	366	<200	1323
133	<20	258	<200	1242
134	<20	318	<200	1242
135	<20	94	<200	681
136	<20	94	<200	771
137	<20	132	<200	1341

Preliminary Characterization Surveys

Building 788 Slab Floor

138	<20	168	<200	1164
139	<20	828	<200	1302
140	<20	360	<200	1413
141	<20	94	<200	927
142	<20	270	<200	1206
143	<20	204	<200	388
144	<20	94	<200	849
145	<20	94	<200	1038
146	<20	120	<200	318
147	<20	234	<200	1200
148	<20	222	<200	1386
149	<20	94	<200	987
150	<20	94	<200	912
151	<20	102	<200	1380
152	<20	144	<200	1347
153	<20	94	<200	888
154	<20	144	<200	1236
155	<20	94	<200	1386
156	<20	94	<200	1014
157	<20	94	<200	1023
158	<20	94	<200	1272
159	<20	94	<200	1428
160	<20	94	<200	1074
161	<20	94	<200	1428
162	<20	94	<200	1107
163	<20	94	<200	1197
164	<20	96	<200	1050
165	<20	94	<200	537
166	<20	94	<200	558
167	<20	94	<200	639
168	<20	94	<200	588
169	<20	94	<200	669
170	<20	94	<200	660
171	<20	94	<200	387
172	<20	94	<200	507
173	<20	94	<200	516
174	<20	94	<200	717
Size	174	174	174	174
Max.	<20	1542	<200	1455
Mean	<20	197.93	<200	954.76
Median	<20	94	<200	963

Preliminary Characterization Surveys

Contamination Control Room Slab Floor

Description:	Contamination Control Room - Slab Floor			
Isotopic Mixture:	Americium-241	Plutonium 239/240		
t_{1/2} (years):	432.2 years	24,065 years		
Survey Point	Removable α Activity (dpm/100cm ²)	Total α Activity (dpm/100cm ²)	Removable β/γ Activity (dpm/100cm ²)	Total β/γ Activity (dpm/100cm ²)
1	<20	1158	<200	1197
2	<20	816	<200	1197
3	<20	264	<200	1203
4	<20	492	<200	1083
5	<20	582	<200	1404
6	<20	1158	<200	1143
7	<20	1358	<200	1116
8	<20	588	<200	1044
9	<20	378	<200	1119
10	<20	348	<200	933
11	<20	972	<200	1104
12	<20	1578	<200	1299
13	24	828	<200	720
14	27	1140	<200	774
15	24	426	<200	852
16	<20	558	<200	702
17	27	1314	<200	870
18	<20	1686	<200	954
19	<20	1038	<200	858
20	<20	1032	<200	870
21	<20	522	<200	1056
22	<20	396	<200	894
23	<20	1254	<200	891
24	27	912	<200	1041
25	<20	1056	<200	948
26	<20	1176	<200	732
27	<20	282	<200	687
28	24	468	<200	642
29	<20	1230	<200	996
30	<20	714	<200	1038
31	27	930	<200	945
32	21	1194	<200	711
33	21	336	<200	858
34	<20	540	<200	786
35	<20	438	<200	750
36	27	1044	<200	939
37	33	780	<200	1221
38	<20	996	<200	944
39	<20	618	<200	900

Preliminary Characterization Surveys

Contamination Control Room Slab Floor

40	<20	552	<200	906
41	45	1248	<200	879
42	<20	180	<200	1068
43	<20	510	<200	918
Size	43	43	43	43
Max.	45	1686	<200	1404
Mean	27.25	816.05	<200	957.95
Median	27	816	<200	939